



# XVIII PICC DAY 2025 BOLOGNA

2-3 dicembre / Palazzo dei Congressi



## ***Prevenzione della trombosi venosa da PICC***

***D. Elisei***

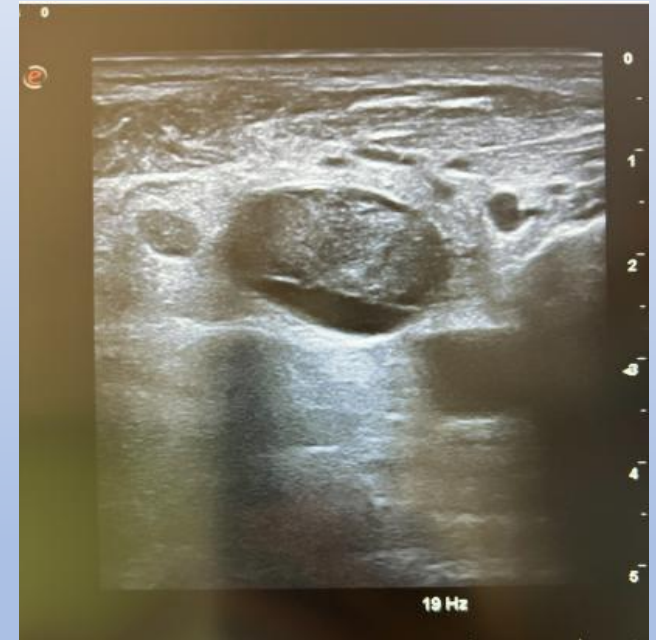
***Dir. U.O. Anestesia e Rianimazione  
AREA VASTA 4, FERMO***



# La CRT, Trombosi Correlata a Catetere E' una conseguenza inevitabile dei VAD

## La trombosi catetere-relata (CRT)

- Inevitabile (inserimento VAD = lesione della parete venosa)
- Ignoriamo il motivo per cui in alcuni VAD o in alcuni pazienti la CRT è più rilevante e diventa sintomatica
- Possiamo prevenirla? **SOLO IN PARTE**



## Thrombosis Research 187 (2020) 103–112



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### Thrombosis Research

journal homepage: [www.elsevier.com/locate/thromres](https://www.elsevier.com/locate/thromres)



#### Review Article

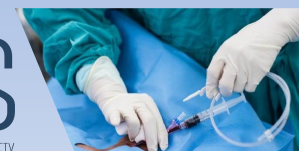
### Central venous catheter-related thrombosis in children and adults

Divyaswathi Citla Sridhar<sup>a,b,1</sup>, Mouhamed Yazan Abou-Ismaïl<sup>a,c,1</sup>, Sanjay P. Ahuja<sup>a,b,\*</sup>

<sup>a</sup> Case Western Reserve University, Cleveland, OH, United States of America

<sup>b</sup> Rainbow Babies & Children's Hospital, Cleveland, OH, United States of America

<sup>c</sup> University Hospitals Cleveland Medical Center, Cleveland, OH, United States of America





Review Article

Central venous

Divyaswathi Citla

<sup>a</sup> Case Western Reserve Univer

<sup>b</sup> Rainbow Babies & Children's

<sup>c</sup> University Hospitals Clevelan

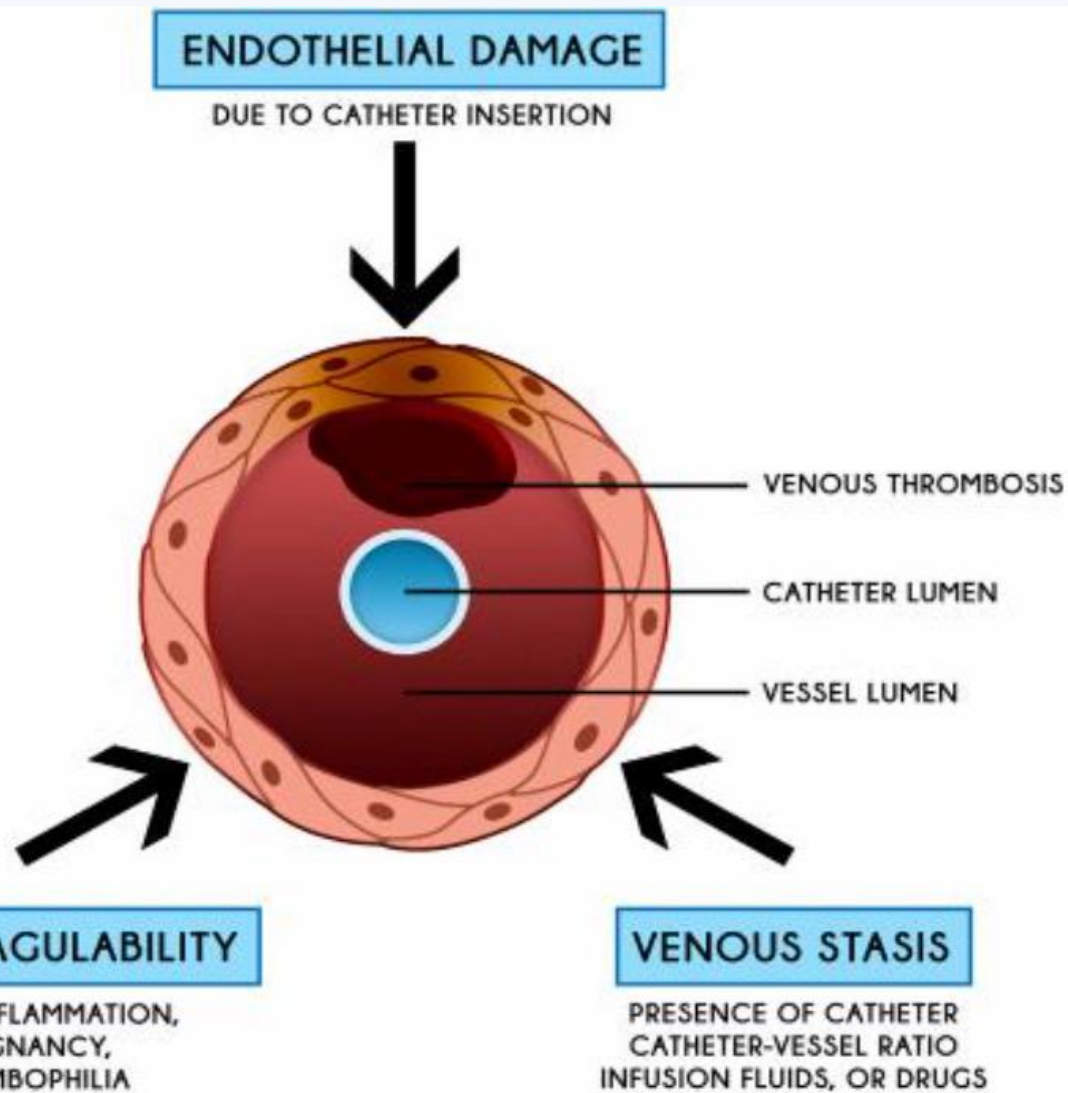


Fig. 1. Virchow's triad as it relates to CRT.

2



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## Review Article

### Anti-fouling strategies for central venous catheters

Alex Wallace<sup>1</sup>, Hassan Albadawi<sup>2</sup>, Nikasha Patel<sup>2</sup>, Ali Khademhosseini<sup>3,4,5,6</sup>, Yu Shrike Zhang<sup>7</sup>, Sailendra Naidu<sup>2</sup>, Grace Knuttinen<sup>2</sup>, Rahmi Oklu<sup>2</sup>

<sup>1</sup>Department of Radiology, <sup>2</sup>Division of Vascular & Interventional Radiology, Mayo Clinic, Phoenix, AZ, USA; <sup>3</sup>Department of Bioengineering, Department of Chemical and Biomolecular Engineering, Henry Samueli School of Engineering and Applied Sciences, University of California-Los Angeles (UCLA), Los Angeles, CA, USA; <sup>4</sup>Department of Radiology, David Geffen School of Medicine, University of California-Los Angeles, Los Angeles, CA, USA; <sup>5</sup>Center for Minimally Invasive Therapeutics (C-MIT), University of California-Los Angeles, Los Angeles, CA, USA; <sup>6</sup>California NanoSystems Institute (CNSI), University of California-Los Angeles (UCLA), Los Angeles, CA, USA; <sup>7</sup>Division of Engineering in Medicine, Department of Medicine, Brigham and Women's Hospital, Harvard Medical School, Cambridge, MA, USA

**Contributions:** (I) Conception and design: R Oklu, A Wallace; (II) Administrative support: R Oklu; (III) Provision of study material or patients: None; (IV) Collection and assembly of data: None; (V) Data analysis and interpretation: None; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

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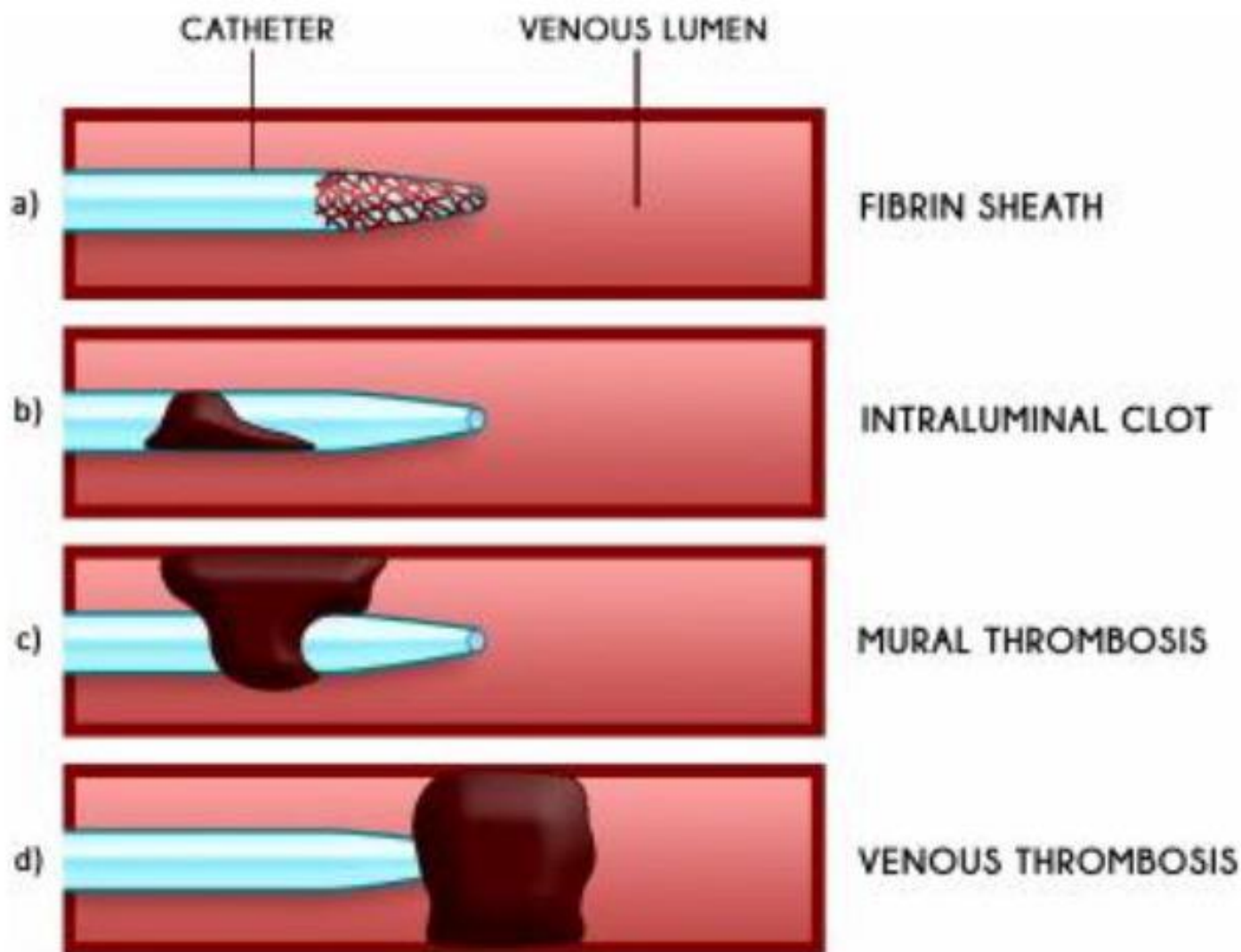
Central veno

Divyaswathi Citl

<sup>a</sup> Case Western Reserve Univ

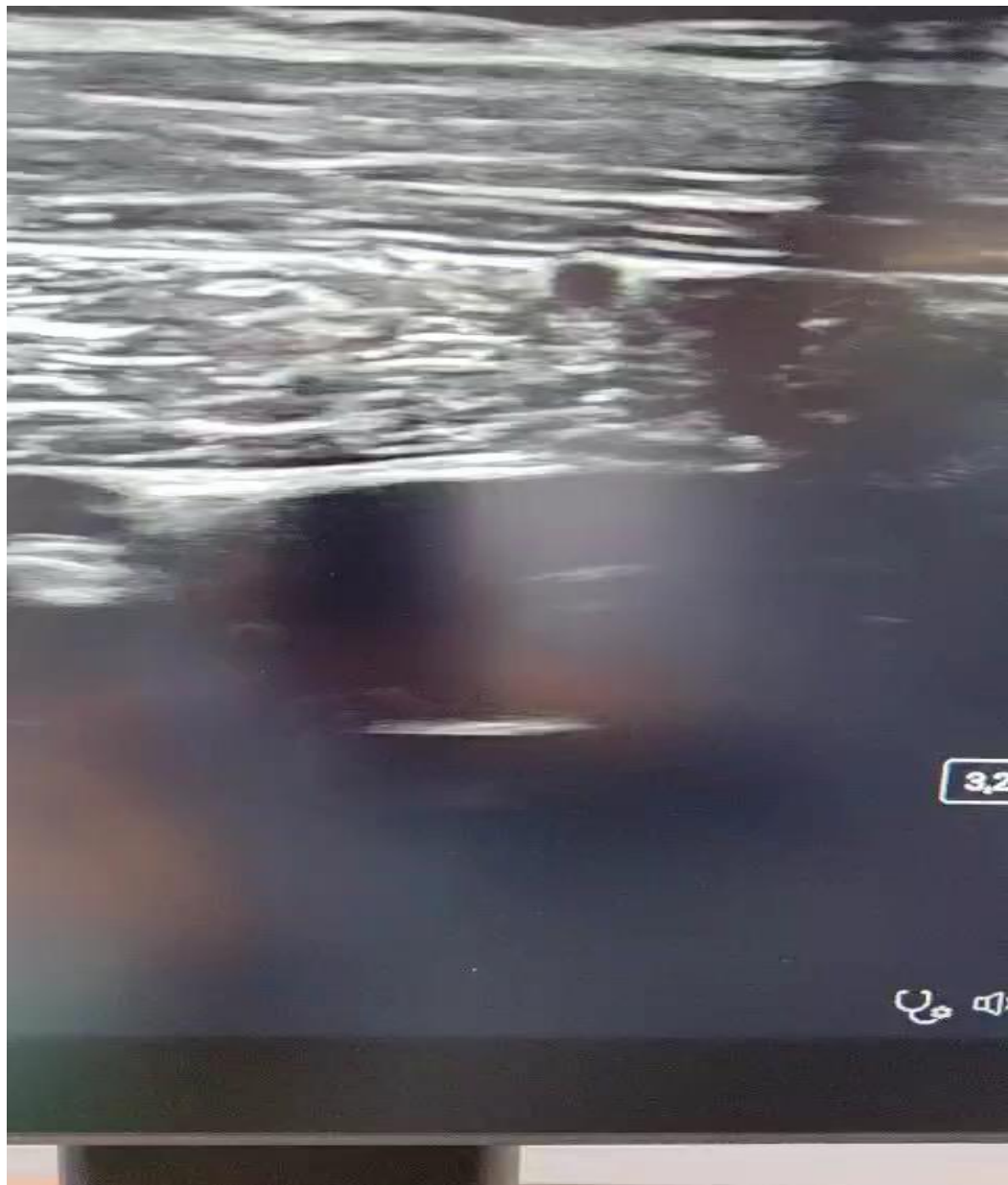
<sup>b</sup> Rainbow Babies & Children

<sup>c</sup> University Hospitals Clevel



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Review



**JVA** | The Journal of  
Vascular Access

# The fibroblastic sleeve, the neglected complication of venous access devices: A narrative review

**Giovanna Passaro** , **Mauro Pittiruti**  and **Antonio La Greca**

The Journal of Vascular Access  
1–13

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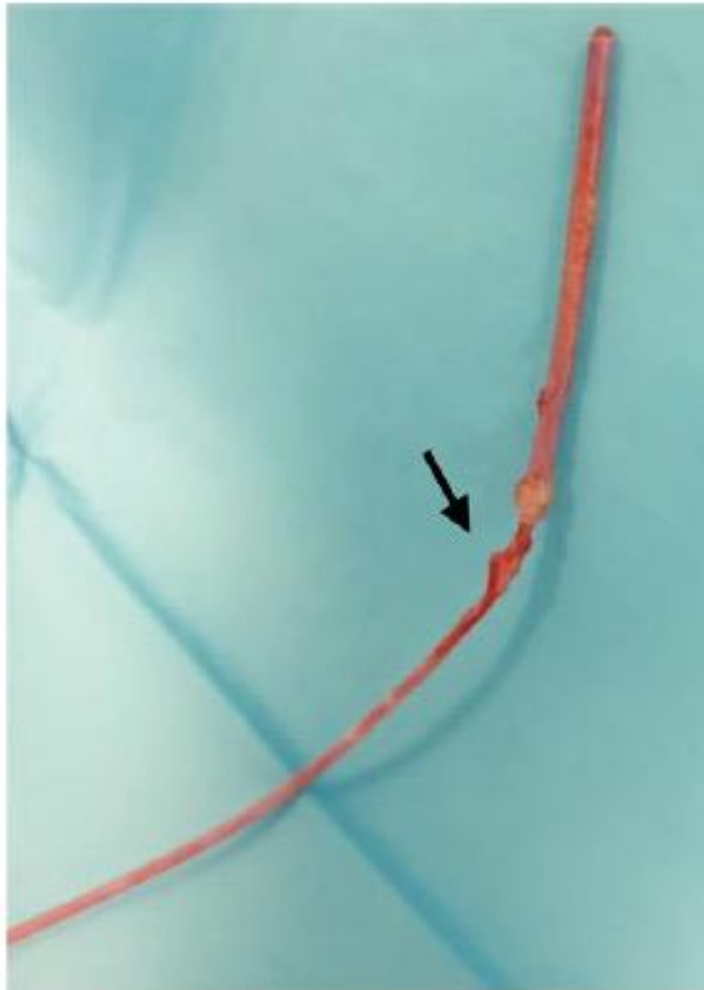
 **SAGE**



Review

# The fibrobl complicatio A narrative

Giovanna Passar



The Journal of  
Vascular Access

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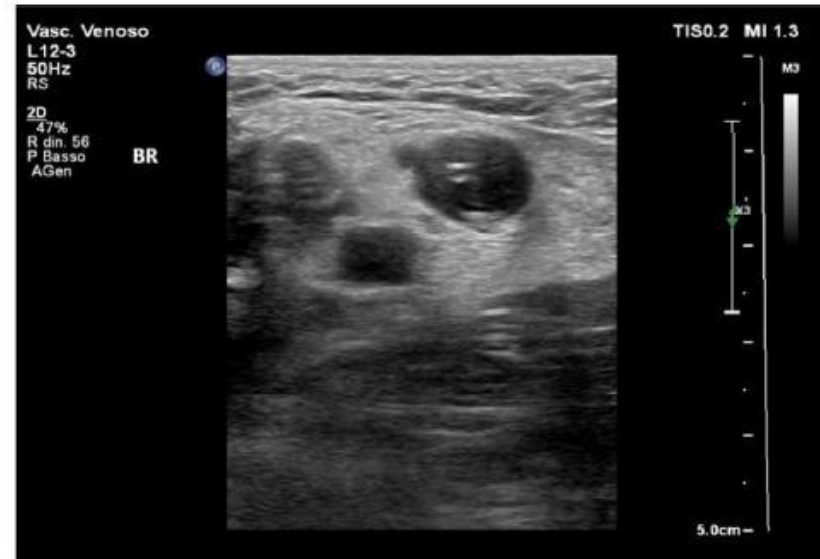
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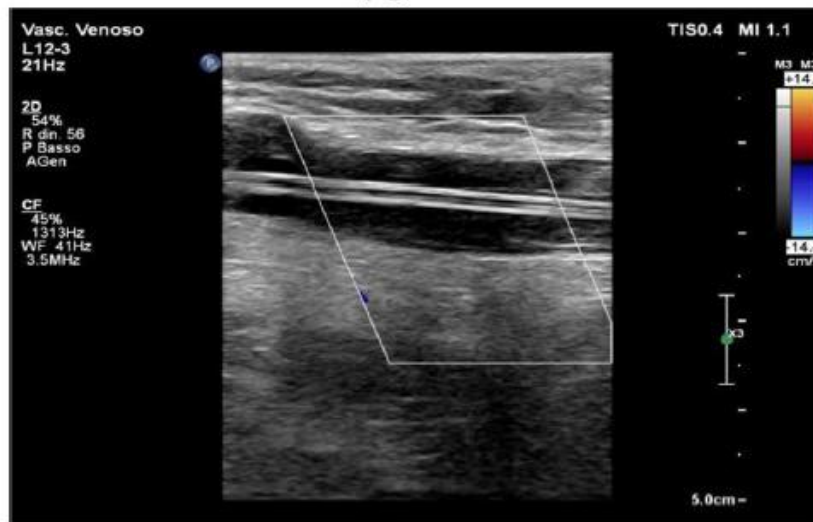
Giovar



(a)



(b)



(c)

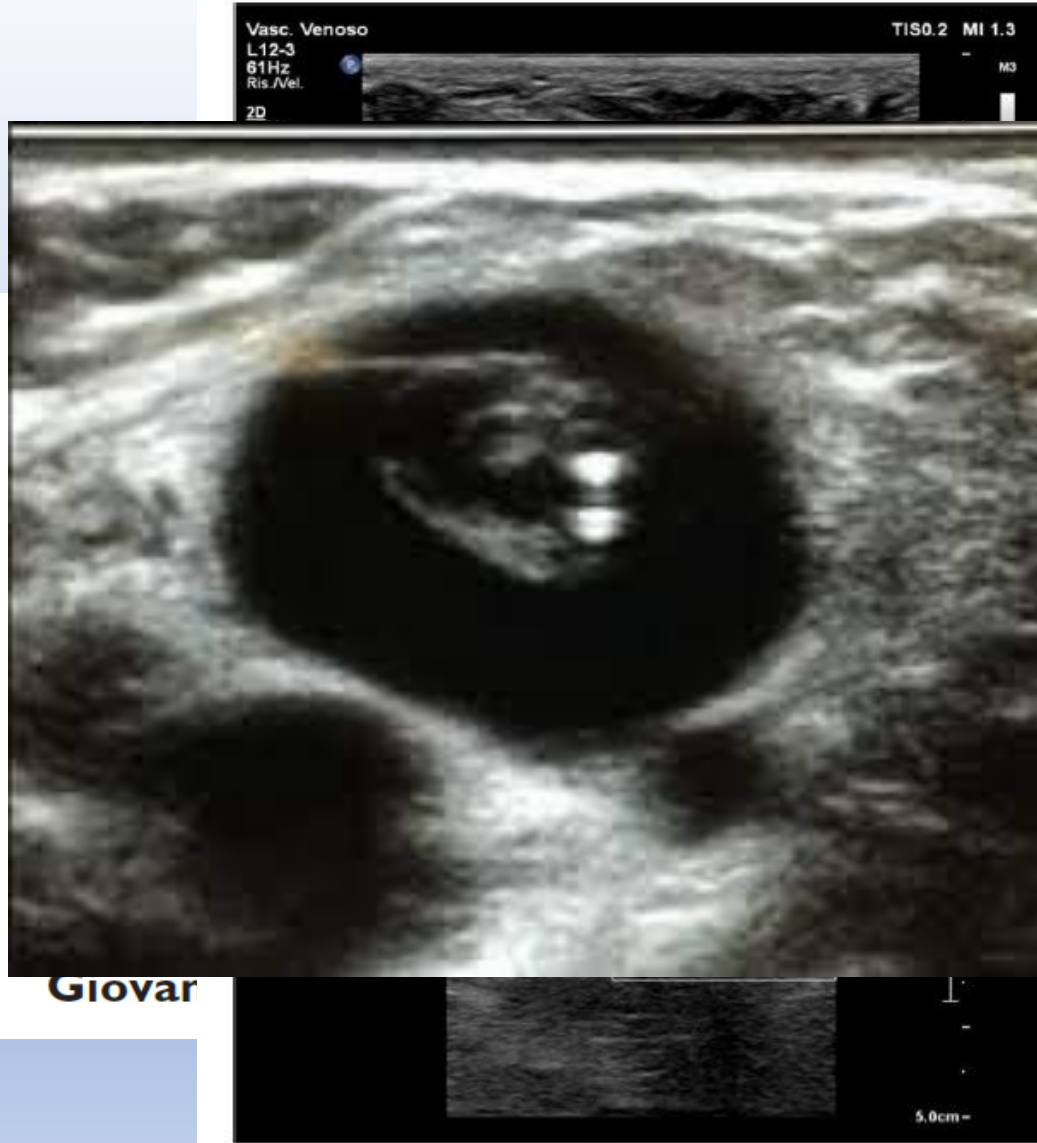


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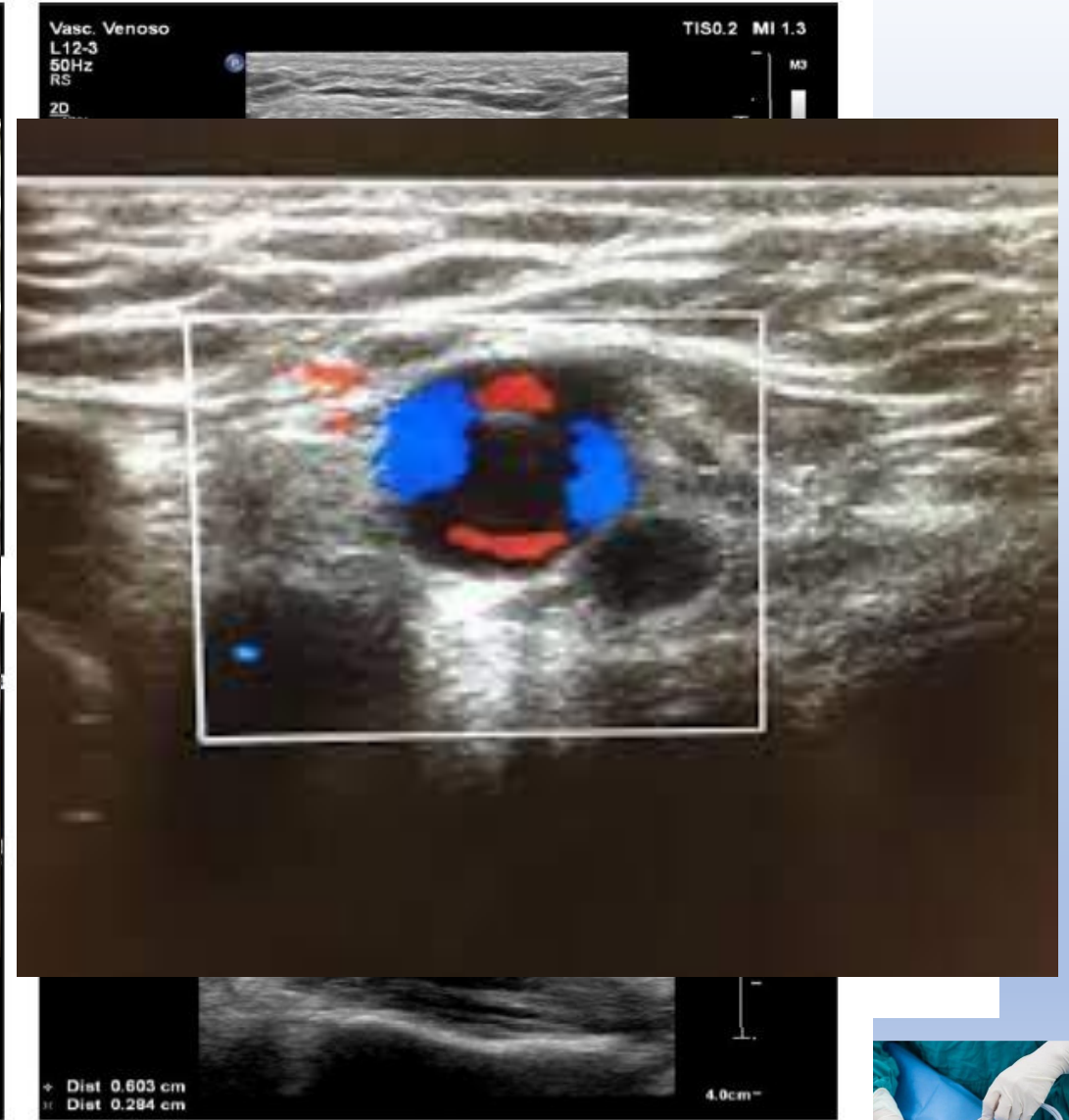
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(d)





**Table 3.** Main differences between catheter-related thrombosis (CRT) and fibroblastic sleeve (FS).

|                                 | CRT                                                                                             | FS                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Etiopathogenesis                | Endothelial damage                                                                              | Foreign body reaction                                                                      |
| Molecular trigger               | Tissue thromboplastin                                                                           | Fibronectin                                                                                |
| Type of tissue                  | Thrombus                                                                                        | Connective tissue                                                                          |
| Location                        | At the site of vein wall damage                                                                 | Around the catheter                                                                        |
| Evolution                       | Fibrosis/reabsorption                                                                           | Reabsorption (?)                                                                           |
| US imaging                      | Mass obstructing the vein<br>Anechoic, and then hypo-echoic<br>Mainly attached to the vein wall | Sleeve all around the catheter<br>Hypo- or hyper-echoic<br>Mainly attached to the catheter |
| Clinical manifestation          | Signs and symptoms of venous obstruction + risk of catheter malfunction                         | Catheter malfunction                                                                       |
| Risk of pulmonary embolism      | Yes                                                                                             | No                                                                                         |
| Need for VAD removal            | Rare (not responsive to therapy)                                                                | Rare (irreversible catheter malfunction)                                                   |
| Preventable with anticoagulants | Yes (not consistently)                                                                          | No                                                                                         |
| Sensitive to thrombolysis       | Yes (in the initial phase)                                                                      | No                                                                                         |
| Pharmacological management      | LMW heparin                                                                                     | None                                                                                       |

**2020**



(c)



(d)



## CONFUSIONE DIAGNOSTICA

- La guaina fibroblastica o 'fibroblasticsleeve' (FS) (precedentemente nota con il nome inappropriato di 'guaina di fibrina' o 'fibrinsleeve') viene oggi **SISTEMATICAMENTE** scambiata per CRT asintomatica da parte di radiologi, angiologi, ecografisti, chirurghi vascolari, e cosiddetti 'esperti' di accessi venosi
- Ciò comporta una sovra indicazione inaccettabile nella prescrizione di trattamenti antitrombotici
- La guaina è un fenomeno fisiopatologico inevitabile (e innocuo) in qualunque dispositivo per accesso venoso, presente nel 100% dei casi e visibile ecograficamente nel 30-40%



# Clinical Case Reports

Open Access

# Clinical Case Reports

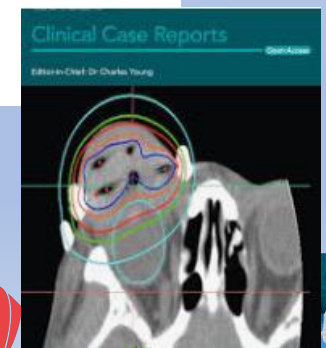
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## CASE REPORT

### **Upper extremity deep vein thrombosis: a complication of an indwelling peripherally inserted central venous catheter**

Peter J. Carr & James C. R. Rippey

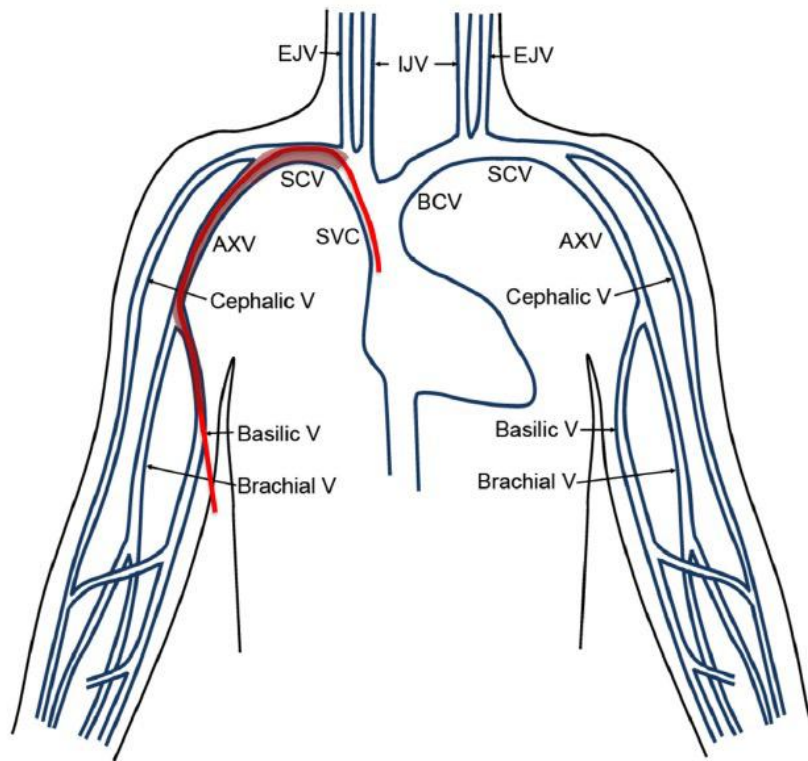
Emergency Medicine, Faculty of Medicine, Dentistry and Health Sciences, School of Primary, Aboriginal and Rural Health Care, University of Western Australia, Nedlands, Western Australia 6009, Australia



# Clinical Case Reports

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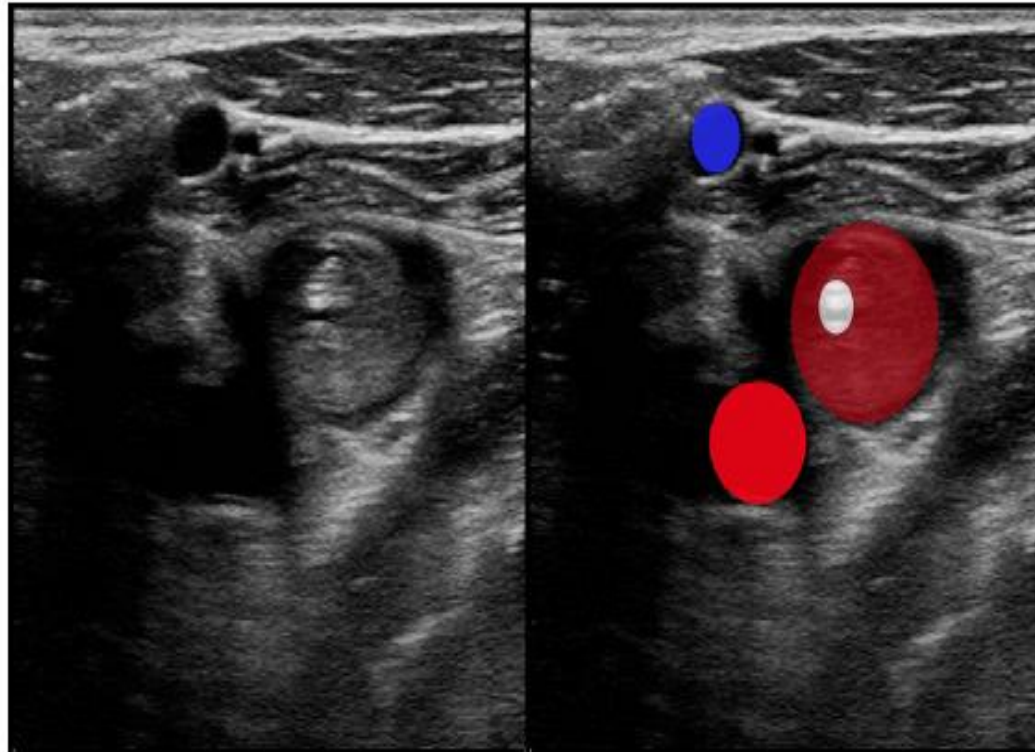
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## Clinical Case Reports

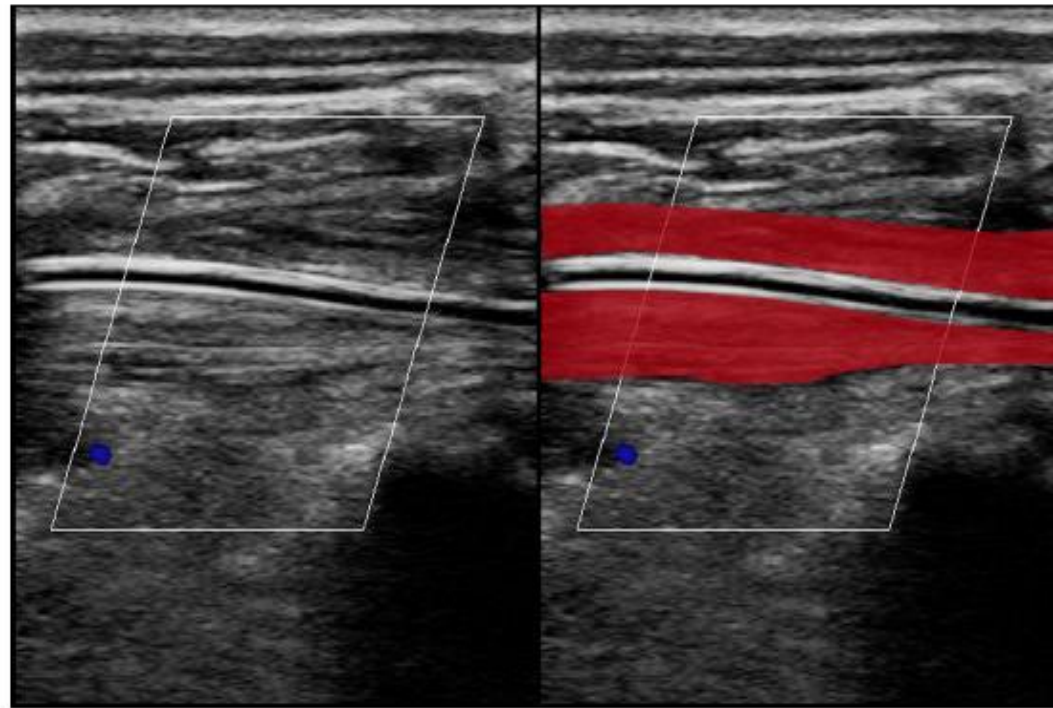


## Clinical Case Reports

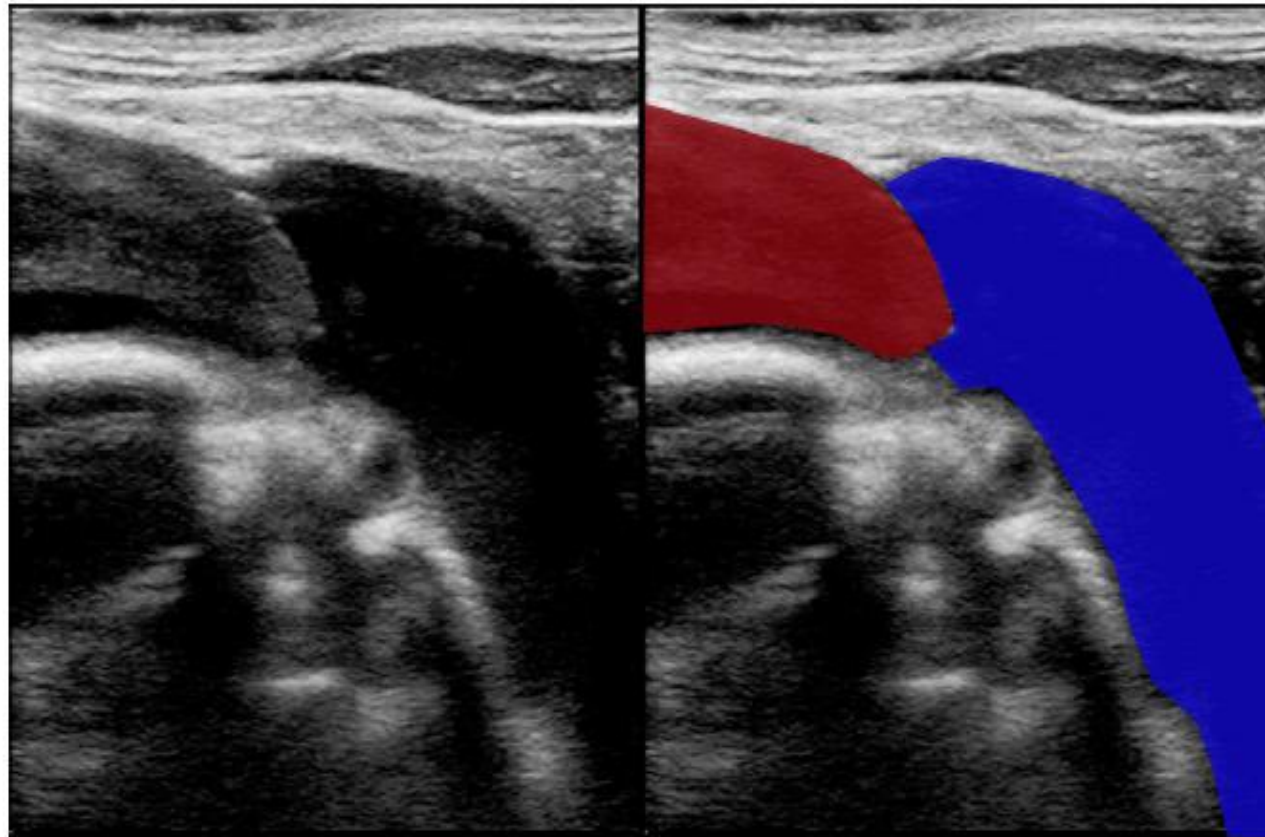


**Figure 4.** Dual images (original left; legend right). A transverse view of the axillary vein with PICC in place, surrounded by echogenic thrombus that is distending the vein (dark red). The axillary artery (red) and cephalic vein (blue) are also seen.

## Clinical Case Reports



**Figure 5.** Dual images (original left; legend right). A longitudinal view of the axillary vein containing the PICC. The line is surrounded by echogenic thrombus (red). [Correction added on 3 February 2015, after first online publication: Figures 5 and 6 captions were interchanged]



**Figure 3.** Dual images (original left; legend right). This image shows the occlusive subclavian vein thrombus (dark red) ending as it meets the right internal jugular vein to form the right brachiocephalic vein (blue).

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<sup>c</sup> University Hospitals Cleveland Medical Center, Cleveland, OH, United States of America



## Thrombosis Research 187 (2020) 103–112

PICC lines are easy to place, readily available for long-term access and easy to remove but the risk of thrombosis is high when compared to CICC

the rate of PICC CRT to be between 2.7 and 3.4% [52]. When compared to CICC, the OR for PICCCRT was 2.55 (1.54–4.23,  $p < 0.0001$ ) and the number needed to harm with PICC relative to CICC was 26 (95% CI 13–71)

These findings were confirmed in another meta-analysis among studies in adults. D. Citla Sridhar, et al. Thrombosis Research 187 (2020) 103–112 106 wherein compared with PICCs, implanted ports were associated with 60% relative risk reduction (RRR).

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<sup>c</sup> University Hospitals Cleveland Medical Center, Cleveland, OH, United States of America



*Original research article*

# Peripherally inserted central catheter–related thrombosis rate in modern vascular access era—when insertion technique matters: A systematic review and meta-analysis

**Paolo Balsorano<sup>1</sup>, Gianni Virgili<sup>2</sup>, Gianluca Villa<sup>3</sup>, Mauro Pittiruti<sup>4</sup>, Stefano Romagnoli<sup>1</sup>, Angelo Raffaele De Gaudio<sup>3</sup> and Fulvio Pinelli<sup>1</sup>**



**PICC-related thrombosis rate in modern vascular access era: when insertion technique matters. A systematic review and meta-analysis**

Paolo Balsorano, MD<sup>1</sup>; Prof. Gianni Virgili<sup>2</sup>; Gianluca Villa, MD, PhD<sup>3</sup>; Mauro Pittiruti, MD<sup>4</sup>; Stefano Romagnoli, MD, PhD<sup>1</sup>; Prof. Angelo Raffaele De Gaudio<sup>3</sup>; Fulvio Pinelli, MD<sup>1</sup>

## **Incidenza di DVT PICC-relata:**

- Paziente Onco-ematologico = 5.9%**
- Paziente Oncologico = 2.2%**
- Altri = 2.4%**



*Review*

# A Comprehensive Review of Catheter-Related Thrombosis

Marina López-Rubio <sup>1,2,3,†</sup> , Marta-Olimpia Lago-Rodríguez <sup>1,2,3,\*,†</sup> , Lucía Ordieres-Ortega <sup>1,2,3</sup> ,  
Christian-Mario Oblitas <sup>1,2</sup> , Sergio Moragón-Ledesma <sup>1,2,3</sup> , Rubén Alonso-Beato <sup>1,2,3</sup>,  
Luis-Antonio Alvarez-Sala-Walther <sup>1,2,3</sup> and Francisco Galeano-Valle <sup>1,2,3</sup> 

<sup>1</sup> Venous Thromboembolism Unit, Internal Medicine Department, Hospital General Universitario Gregorio Marañón, 28007 Madrid, Spain; marinalopezrubio@outlook.com (M.L.-R.); lucia.oomere@gmail.com (L.O.-O.); crhistian.cao@gmail.com (C.-M.O.); smoragonledesma@gmail.com (S.M.-L.); ralonso\_92@hotmail.com (R.A.-B.); laalvarez@med.ucm.es (L.-A.A.-S.-W.); paco.galeano.valle@gmail.com (F.G.-V.)

<sup>2</sup> School of Medicine, Universidad Complutense de Madrid, 28040 Madrid, Spain

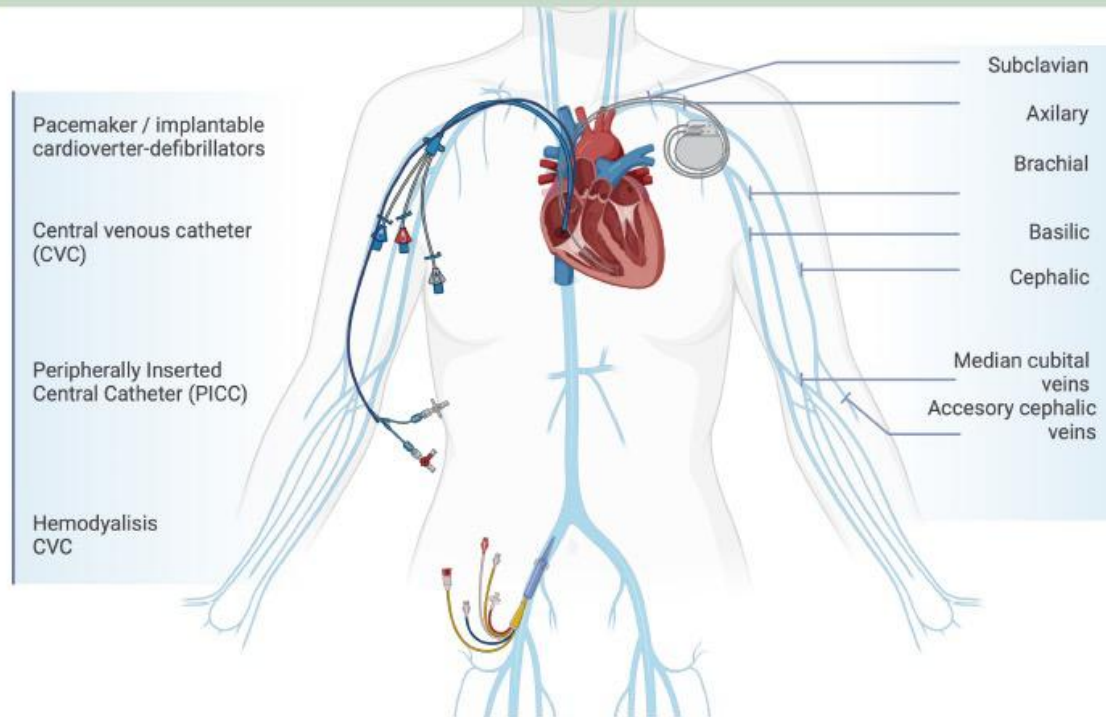
<sup>3</sup> Sanitary Research Institute Gregorio Marañón, 28009 Madrid, Spain

\* Correspondence: mlagorodr@gmail.com; Tel.: +34-915868259

† These authors contributed equally to this work.



## UPPER EXTREMITIES VEIN ANATOMY AND TYPES OF CATHETERS AND IMPLANTABLE DEVICES



† These authors contributed equally to this work.



## and Thrombosis

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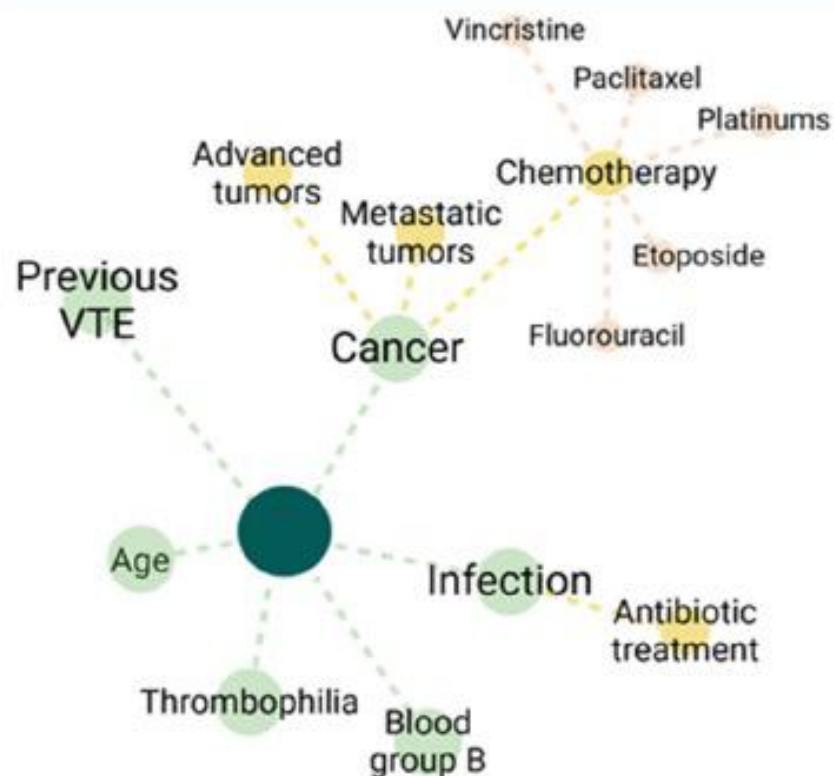
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com (S.M.-L.);  
A.A.-S.-W.);

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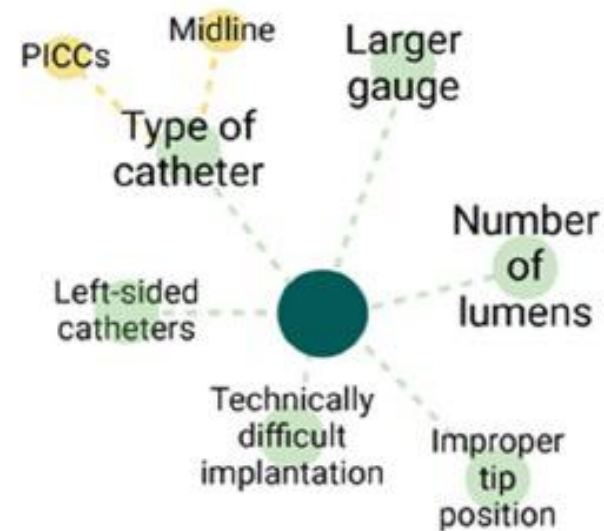


## CATHETER-RELATED THROMBOSIS RISK FACTORS

### PATIENT-RELATED



### CATHETER-RELATED



### Pre-Insertion

Ultrasound evaluation of the patency of the arm veins to rule out thrombosis

Identification of the median nerve and the brachial artery

Proper antiseptic techniques

Vein (basilic, brachial) caliber selection with a catheter/vein ratio  $< 1/3$

Pocket creation in the green zone (Dawson's ZIM)

### At Insertion

Silicone device material

Small sample size needles

Microintroducer kits

Ultrasound-guided venipuncture and tip navigation

Subcutaneous tunnelling and non-tapering

### Post Insertion

Tip location at the superior vena cava/right atrium junction

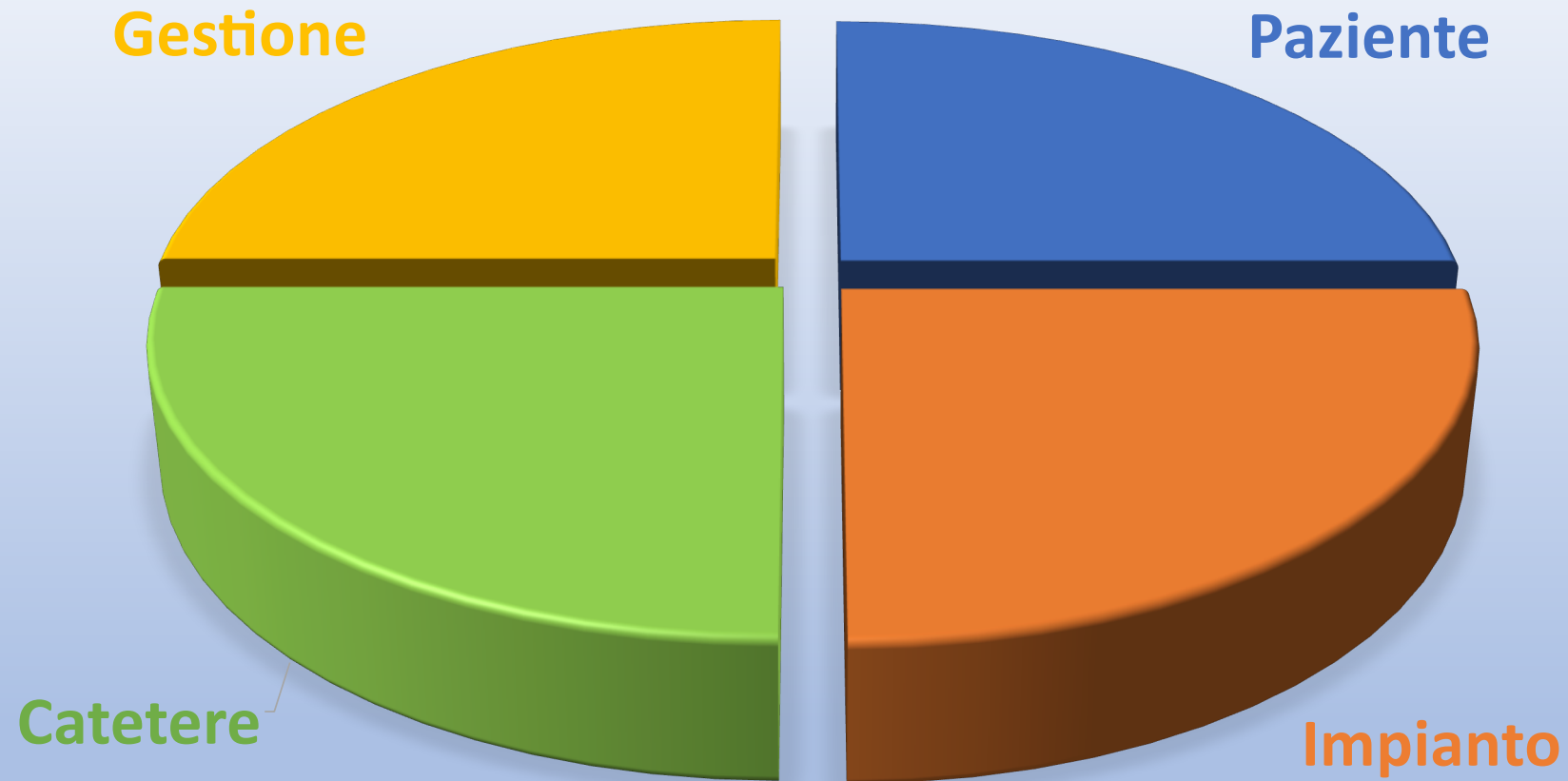
Assessment of the correct tip position by intracavitary electrocardiogram

Proper securement

Appropriate protection of the exit site

Ambulatory care and maintenance of PICC line by specialist nurse team

## STRATEGIE PER LA PREVENZIONE DELLA DVT PICC-relata



## STRATEGIE PER LA PREVENZIONE DELLA DVT PICC-relata

Gestione

Paziente

Catetere

Impianto

**Fattori di rischio legati al paziente:**

- Diagnosi
- Comordibilità
- Anatomia



## STRATEGIE PER LA PREVENZIONE DELLA DVT PICC-relata

Gestione

Paziente

Paziente

Cateter

**Fattori di rischio legati al paziente:**

- Diagnosi
- Comordibilità
- Anatomia

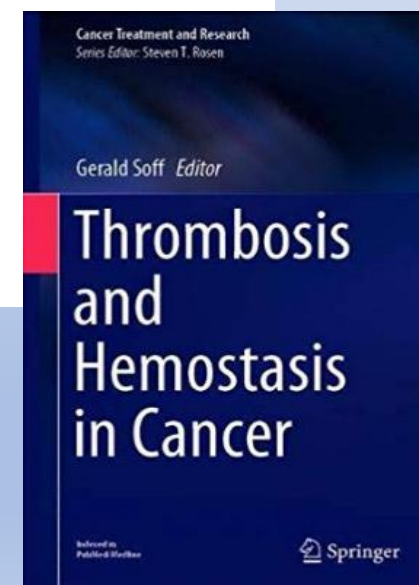




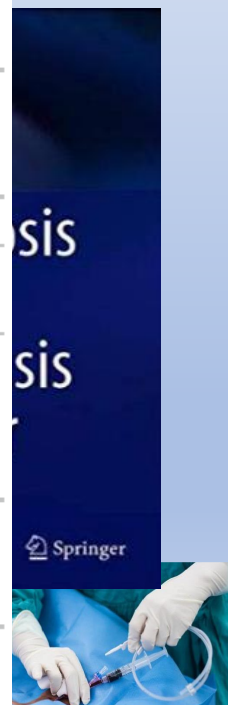
# Etiology and Management of Upper-Extremity Catheter-Related Thrombosis in Cancer Patients

Anita Rajasekhar and Michael B. Streiff

8



| Device-related factors                                                                                | Patient-related factors                        | Treatment-related factors                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Multiple insertion attempts [9]                                                                       | Malignancy<br>Metastatic > localized [17, 28]  | Ongoing cancer therapy [4, 29, 30]<br>Radiation therapy to the chest [17]<br>Bolus (vs. diluted) chemotherapy infusions [18]<br>Antiangiogenic agents and platinum therapy [31] |
| Catheter insertion site (femoral > jugular > subclavian) [8, 25, 27, 28, 32]                          | Recent trauma/surgery within 30 days [5, 20]   | Erythrocyte-stimulating agents [28]                                                                                                                                             |
| Large catheter size-to-vein-diameter ratio [4, 7]                                                     | History of VTE [20, 32]                        | Parenteral nutrition [21]                                                                                                                                                       |
| CVT subtype (PICC > centrally inserted catheter > implanted port) [4, 8, 32, 33]                      | End-stage renal disease [4, 20, 22]            | Surgery [30]                                                                                                                                                                    |
| Catheter infection [34]                                                                               | Critically ill patients [33]                   |                                                                                                                                                                                 |
| Improper catheter position (not at atriocaval junction) [32]                                          | Systemic or catheter-related infection [5, 34] |                                                                                                                                                                                 |
| Number of lumens and catheter size (6F triple-lumen > 5F double-lumen > 4F single-lumen) [20, 29, 28] | Older age [27]                                 |                                                                                                                                                                                 |
| CVAD material (polyethylene or polyvinylchloride > silicone or polyurethane) [23]                     | Immobilization within 30 days [5]              |                                                                                                                                                                                 |
| Previous CVAD [8, 28]                                                                                 | Inherited thrombophilia [24, 28, 35]           |                                                                                                                                                                                 |



**La CRT è più probabile che si verifichi:**

- **Nei pazienti con specifiche anomalie congenite che favoriscono la CRT**
- **Nei pazienti oncologici (alcuni tumori più di altri)**
- **Nei pazienti che hanno una storia di precedente CRT**
- **Nei pazienti con malattie ematologiche**
- **In pazienti con infiammazione sistemica (sepsi, traumi, ecc.)**



# Profilassi farmacologica



ANNALS OF  
**ONCOLOGY**  
driving innovation in oncology

## SPECIAL ARTICLE

### Venous thromboembolism in cancer patients: ESMO Clinical Practice Guideline<sup>☆</sup>

A. Falanga<sup>1,2</sup>, C. Ay<sup>3</sup>, M. Di Nisio<sup>4</sup>, G. Gerotziafas<sup>5</sup>, L. Jara-Palomares<sup>6,7</sup>, F. Langer<sup>8</sup>, R. Lecumberri<sup>9,10</sup>, M. Mandala<sup>11</sup>, A. Maraveyas<sup>12</sup>, I. Pabinger<sup>3</sup>, M. Sinn<sup>8</sup>, K. Syrigos<sup>13</sup>, A. Young<sup>14</sup> & K. Jordan<sup>15,16</sup>, on behalf of the ESMO Guidelines Committee<sup>\*</sup>



2023

- Routine pharmacological prophylaxis of CRT is not recommended [II, D].

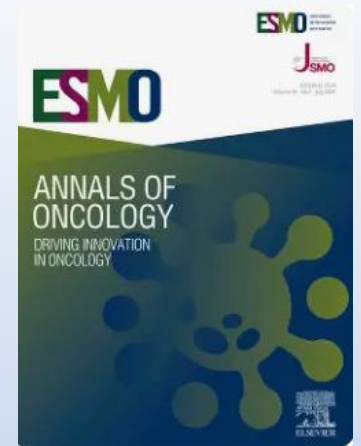


# Profilassi farmacologica

Quali pazienti?

Solo pazienti selezionati

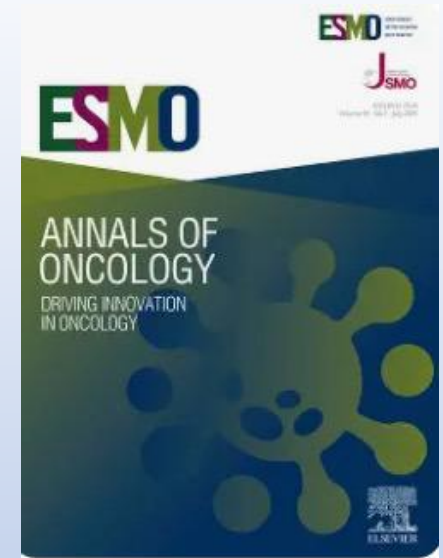
- Pazienti con anomalie congenite della coagulazione associate ad alto rischio di trombosi
- Pazienti con anamnesi di precedente CRT
- Pazienti oncologici con anamnesi di trombosi venosa
- Pazienti ematologici (?)



# Profilassi farmacologica

## Quale farmaco?

- Eparina a basso peso molecolare
- Fondaparinux
- DOAC (?)



# Profilassi farmacologica

- Necessario **bilanciare il rischio trombotico** con i **rischi correlati alla profilassi anticoagulante** (eventi emorragici, trombocitopenia o osteoporosi da eparina)
- **L'onere** dell'iniezione giornaliera di LMWH è **considerevole**



## STRATEGIE PER LA PREVENZIONE DELLA DVT PICC-relata

Gestione

Paziente

Catetere

Impianto

**Fattori di rischio legati all'impianto:**

- Ecoanatomia e scelta della vena
- Ecoguida
- Ideale exit-site/tunnellizzazione
- Posizione della punta



## STRATEGIE PER LA PREVENZIONE DELLA DVT PICC-relata

Gestione

Paziente

Cateter

Impianto

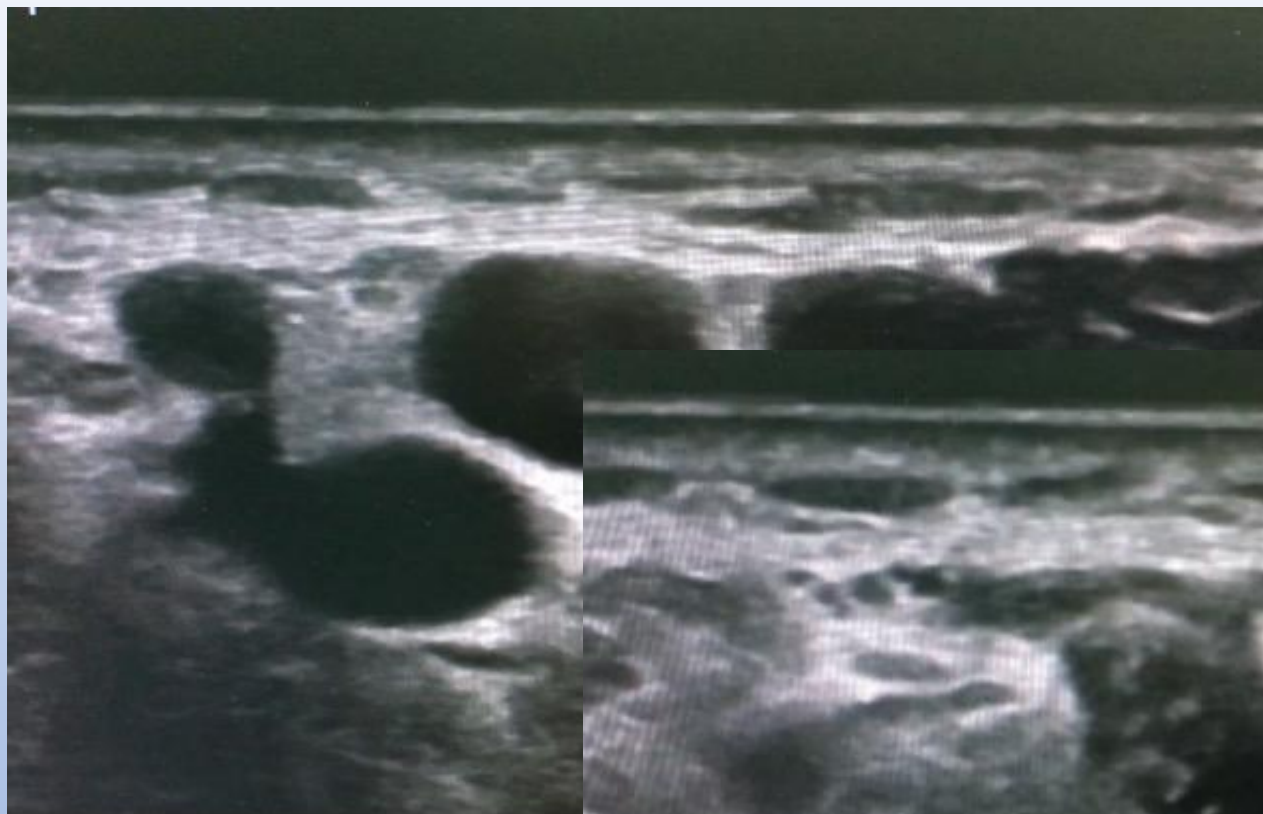
### Fattori di rischio legati all'impianto:

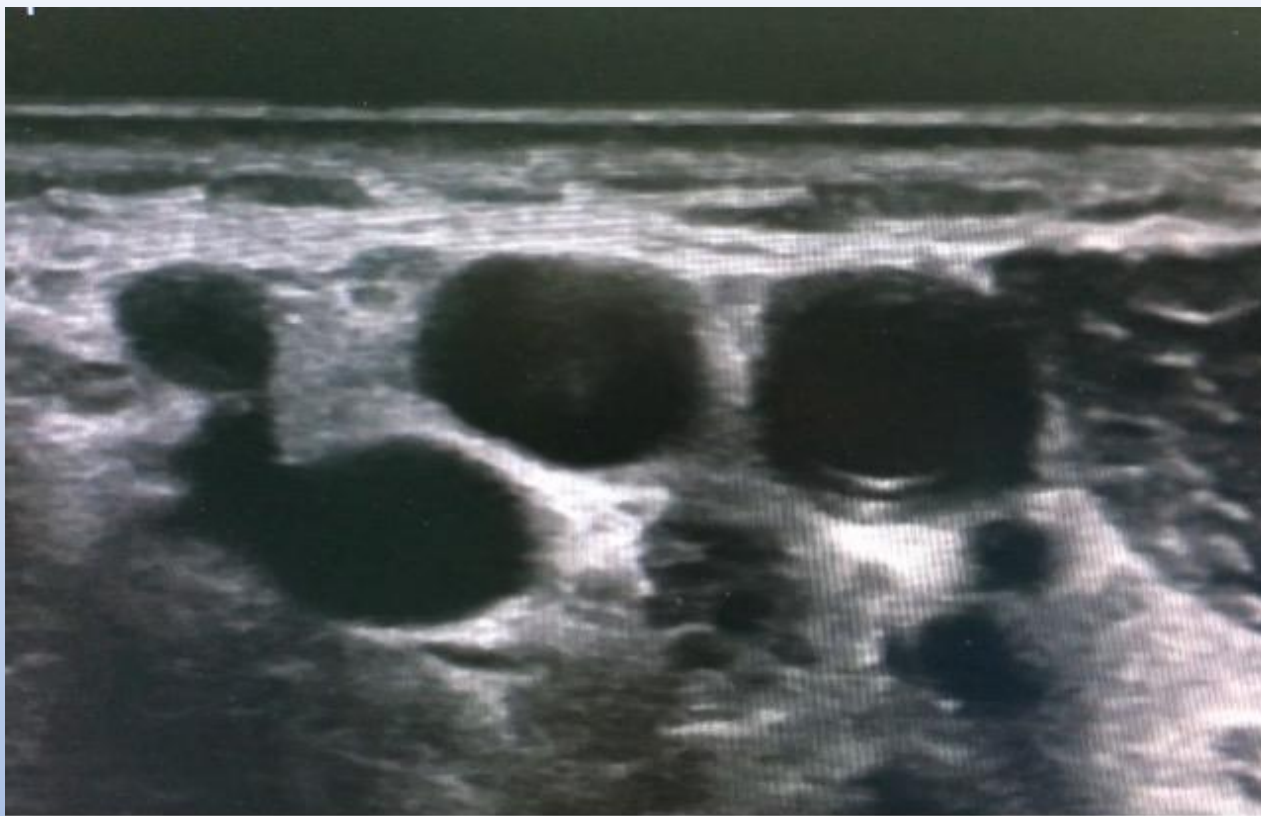
- Ecoanatomia e scelta della vena
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- Posizione della punta

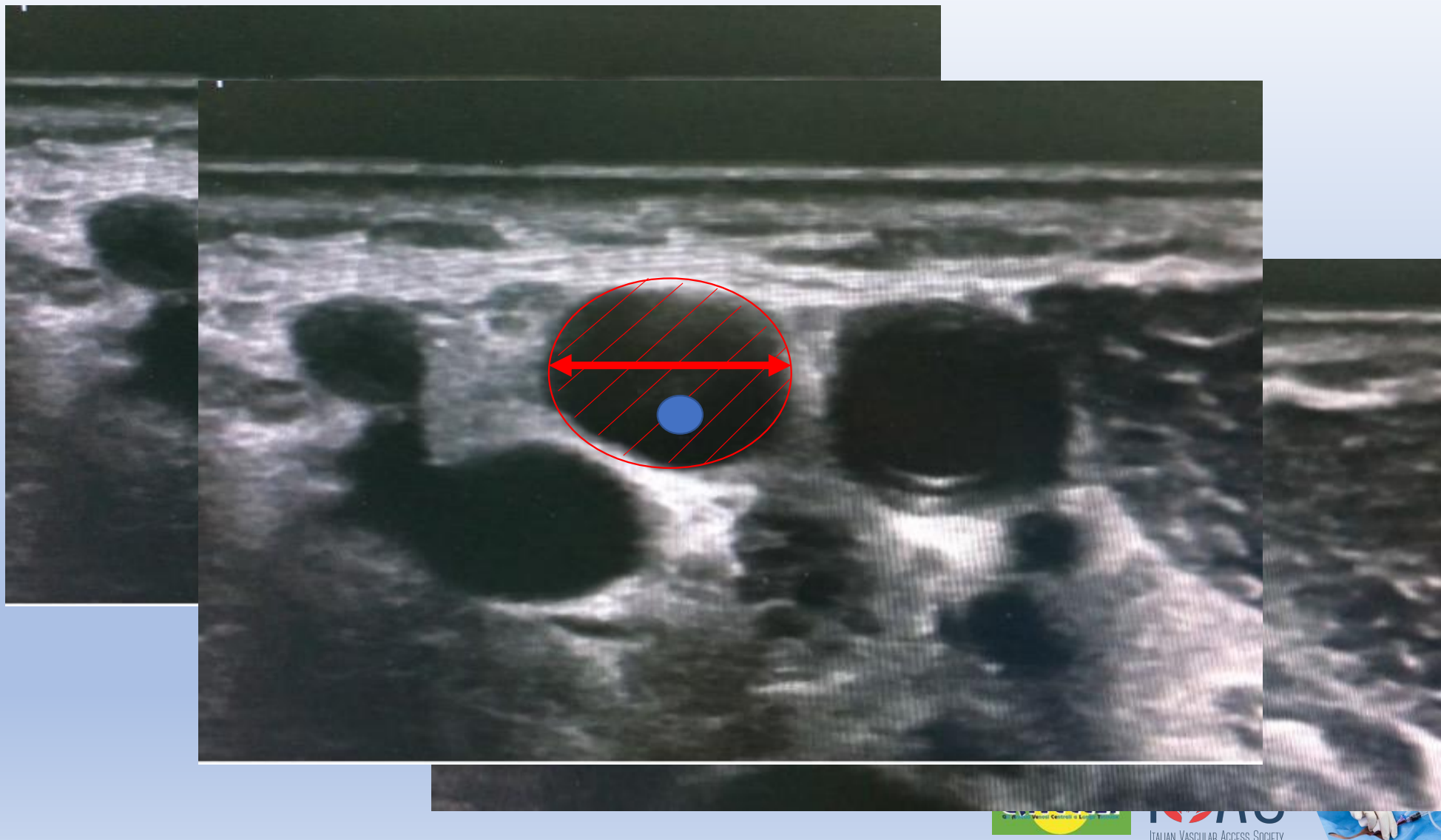


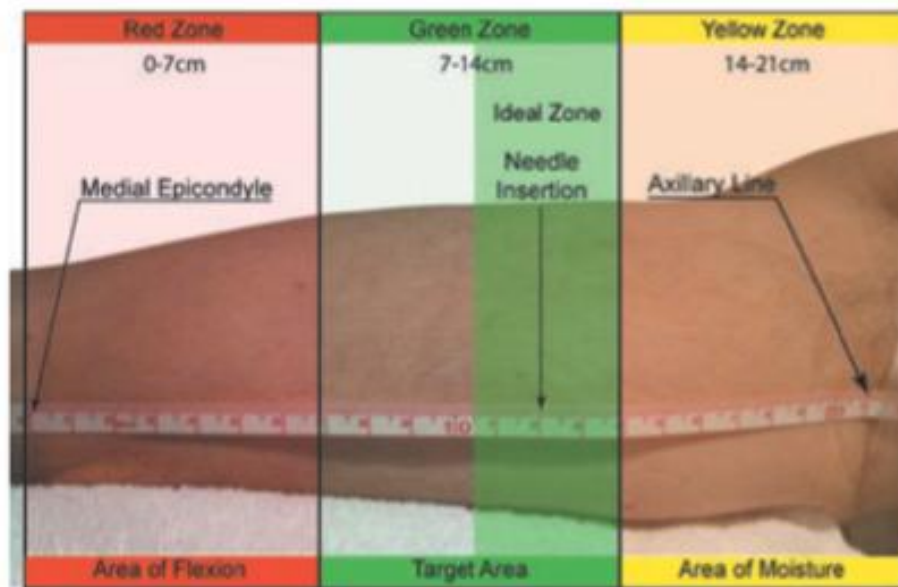
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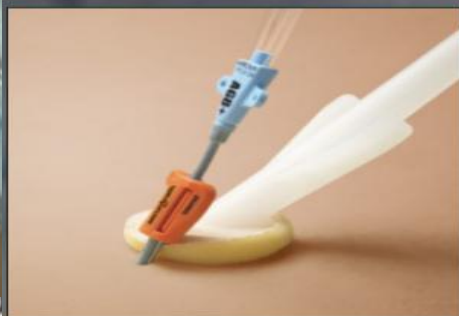




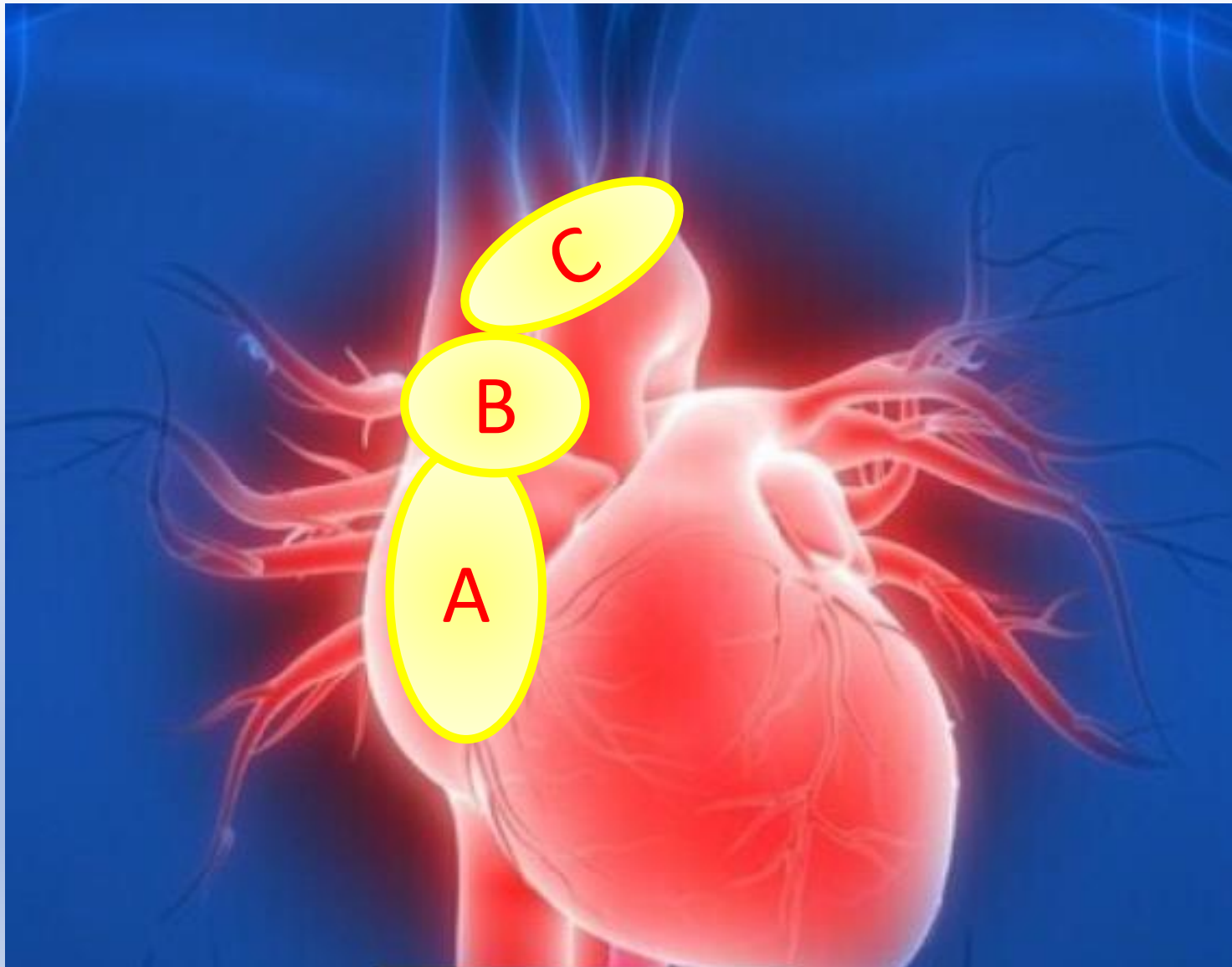


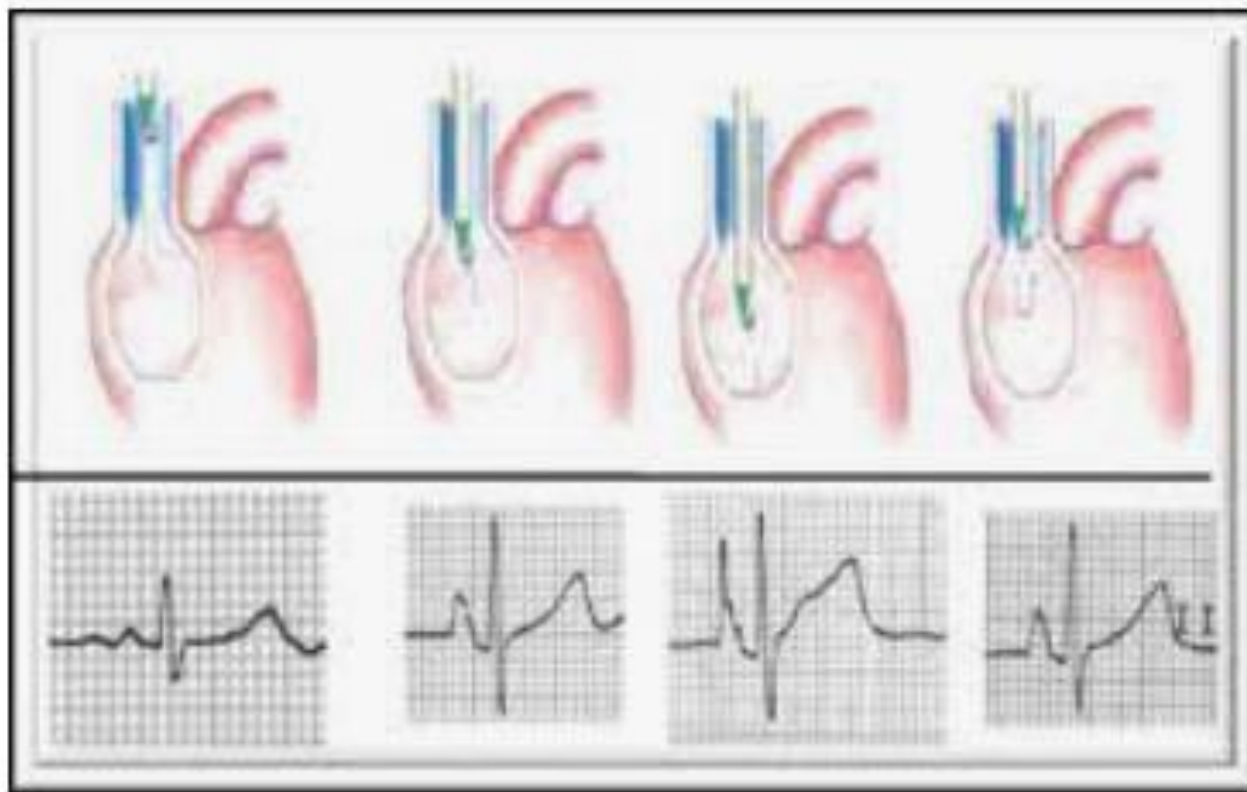
**PICC Zone Insertion Method™ (ZIM™):**  
**A Systematic Approach to Determine the Ideal Insertion**  
**Site for PICCs in the Upper Arm**





A Systematic Ap  
Site for PICCs in





Editorial



**JVA** | The Journal of  
Vascular Access

# **ECHOTIP: A structured protocol for ultrasound-based tip navigation and tip location during placement of central venous access devices in adult patients**

**Antonio La Greca<sup>1</sup>, Emanuele Iacobone<sup>2</sup> , Daniele Elisei<sup>2</sup>,  
Daniele Guerino Biasucci<sup>3</sup> , Vito D'Andrea<sup>4</sup> ,  
Giovanni Barone<sup>5</sup>, Geremia Zito Marinosci<sup>6</sup>  
and Mauro Pittiruti<sup>1</sup> **

The Journal of Vascular Access  
1–10

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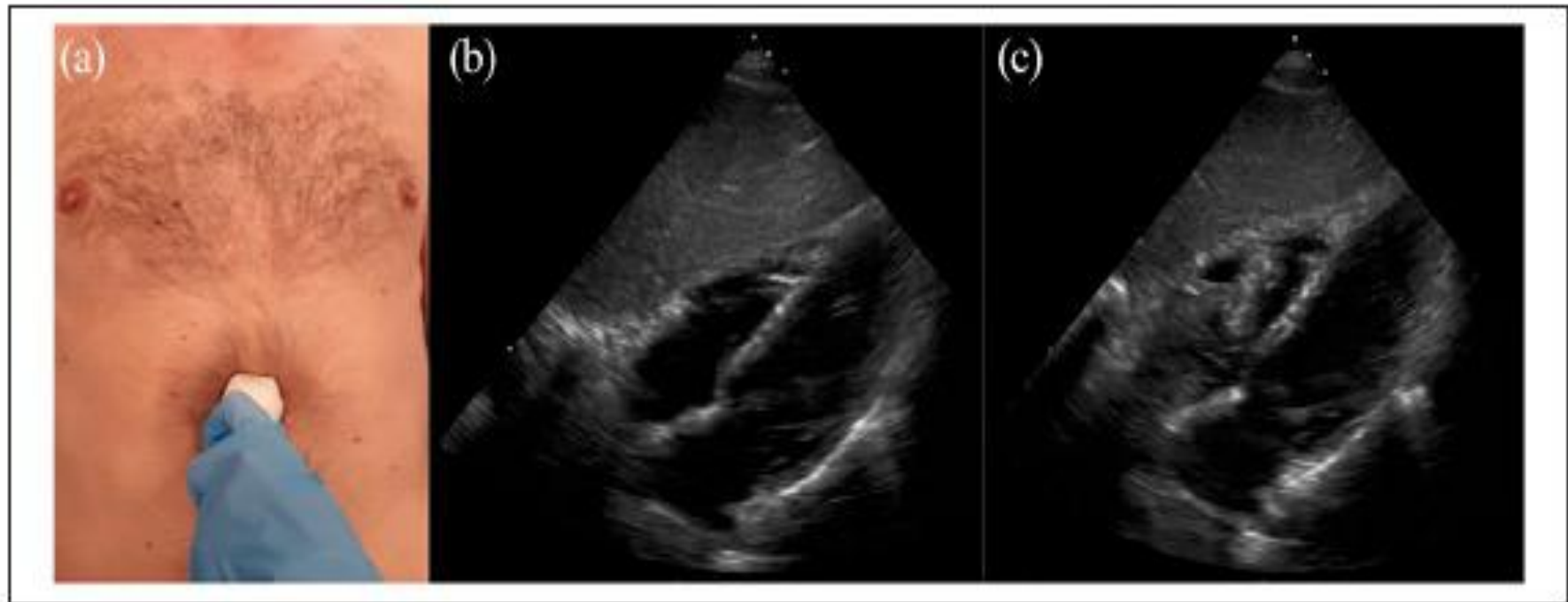
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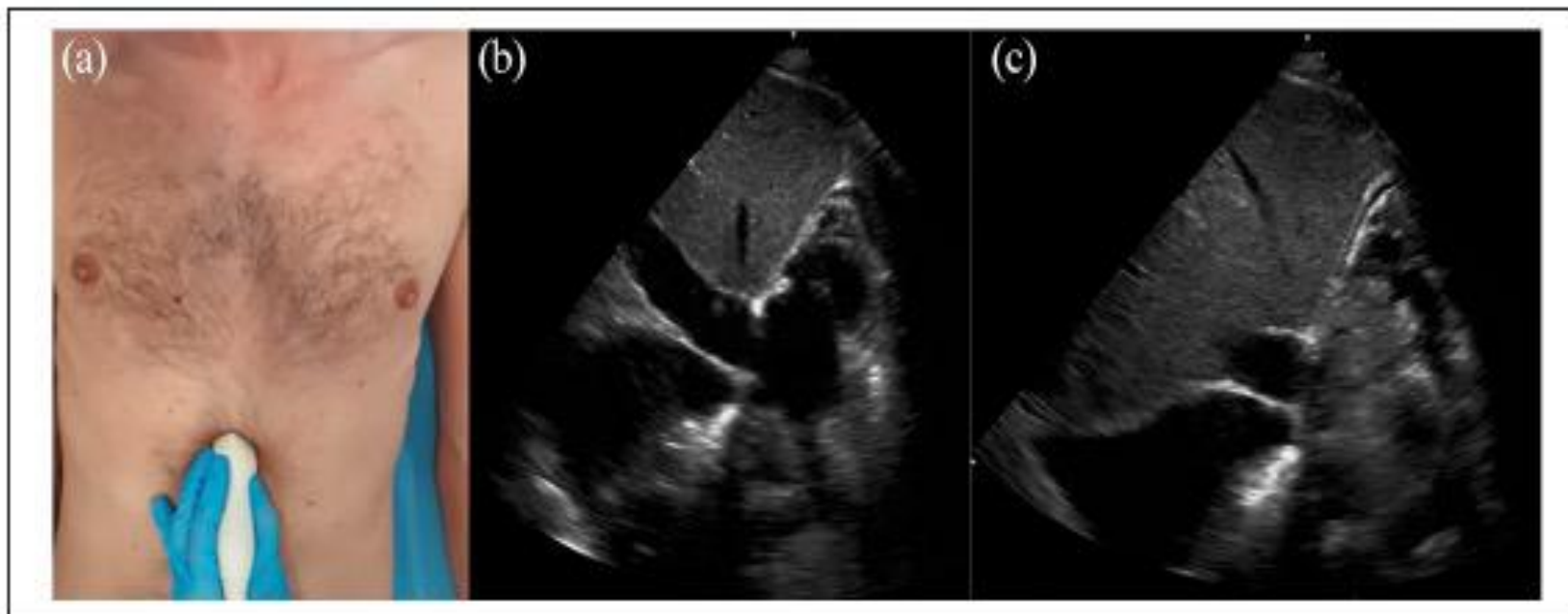




**Figure 1.** Subcostal (longitudinal) four-chamber view: placement of the probe (a), visualization of the heart chambers (b), and visualization of the microbubbles in the right atrium (c).

Daniela Cacioppo , Vice President,  
**Giovanni Barone<sup>5</sup>, Geremia Zito Marinosci<sup>6</sup>**  
and **Mauro Pittiruti<sup>1</sup>** 



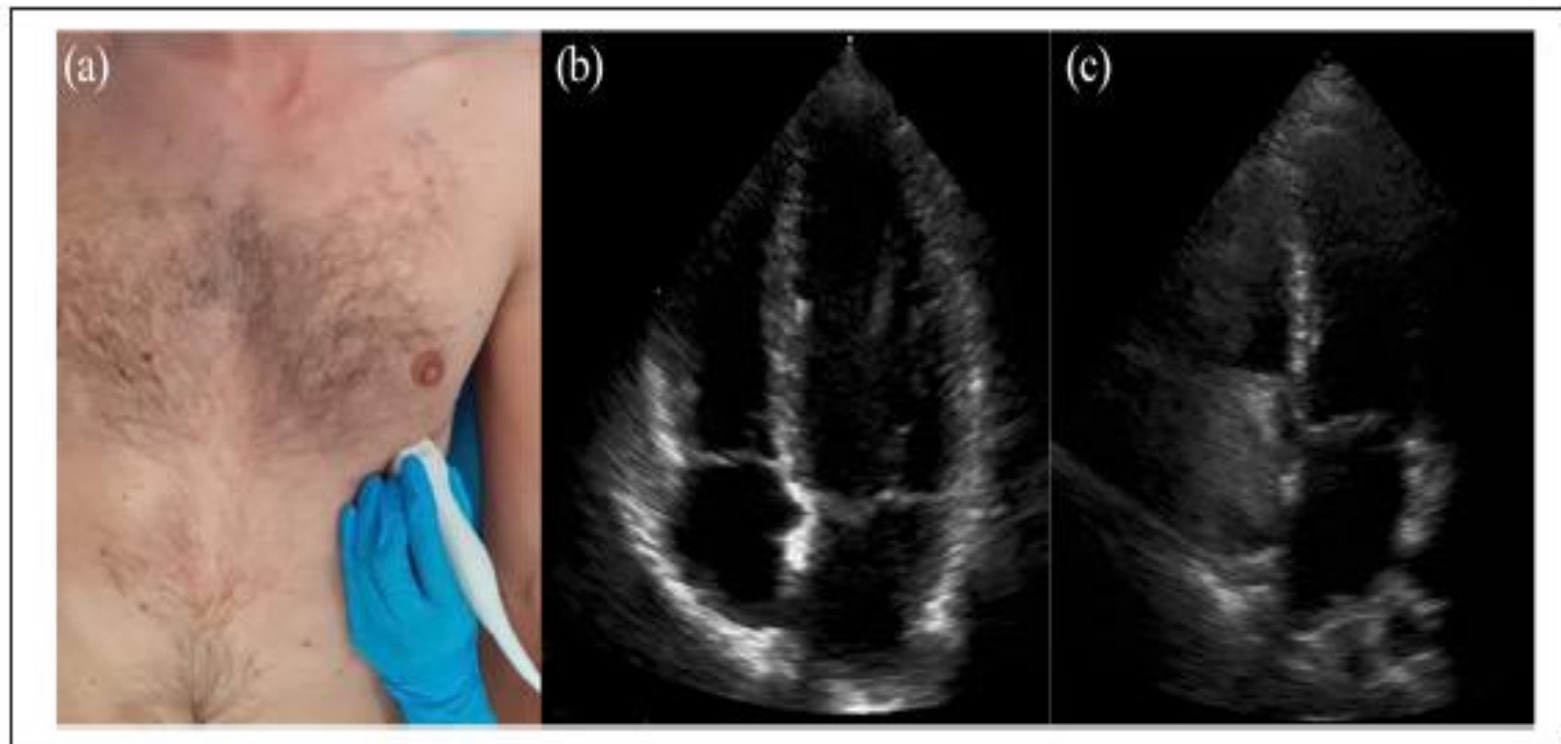


**Figure 2.** Subcostal (oblique) bi-caval view: placement of the probe (a), visualization of the superior vena cava, inferior vena cava, and right atrium (b), and visualization of the microbubbles in the right atrium (c).

Visualization of the microbubbles in the right atrium (c).

**Giovanni Barone<sup>5</sup>, Geremia Zito Marinosci<sup>6</sup>**  
and **Mauro Pittiruti<sup>1</sup>**





**Figure 3.** Transthoracic apical four-chamber view: placement of the probe (a), visualization of the heart chambers (b), and visualization of the microbubbles in the right atrium (c).



Original research article

**JVA** | The Journal of  
Vascular Access

# **Transthoracic echocardiography as bedside technique to verify tip location of central venous catheters in patients with atrial arrhythmia**

**Emanuele Iacobone<sup>1</sup> , Daniele Elisei<sup>1</sup>, Diego Gattari<sup>1</sup>,  
Luigi Carbone<sup>1</sup> and Giuseppe Capozzoli<sup>2</sup>**

The Journal of Vascular Access  
1-7

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DOI: 10.1177/1129729820905200

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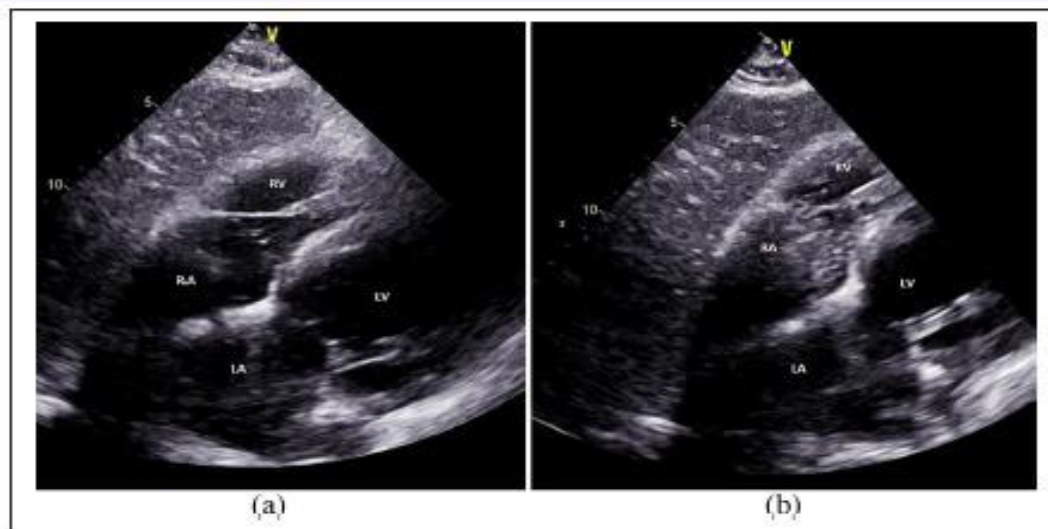


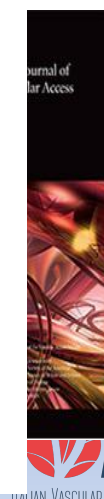
Figure 1. (a) Subcostal four-chamber view showing left atrium, left ventricle, right atrium (RA), right ventricle (RV) and (b) visualization of the bubble effect within the RA, leading into the RV in subcostal four-chamber view during saline flush injection.



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## STRATEGIE PER LA PREVENZIONE DELLA DVT PICC-relata

Gestione

Paziente

Catetere

Impianto

Fattori di rischio legati  
al catetere:

- Materiale
- Valvole
- Reverse tapering
- Fissaggio



## STRATEGIE PER LA PREVENZIONE DELLA DVT PICC-relata

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- Reverse tapering
- Fissaggio





# CHEST

## Original Research

DEEP VEIN THROMBOSIS

# Risk of Symptomatic DVT Associated With Peripherally Inserted Central Catheters

*R. Scott Evans, PhD; Jamie H. Sharp, RN, CNSN; Lorraine H. Linford, RN, BS, CNSN; James F. Lloyd, BS; Jacob S. Tripp, PhD; Jason P. Jones, PhD; Scott C. Woller, MD; Scott M. Stevens, MD; C. Gregory Elliott, MD, FCCP; and Lindell K. Weaver, MD, FCCP*

**CHEST 2010; 138(4):803-810**

**Table 2—Characteristics of Patients With PICC-Associated DVT at Intermountain Medical Center During 2008**

| Characteristic                                                | No.        |
|---------------------------------------------------------------|------------|
| Total PICC insertions with DVT (%)                            | 60 (3.0)   |
| Total distinct patients with DVT                              | 57         |
| Patients with two DVTs during same hospitalization            | 2          |
| Patients with two DVTs during different hospitalizations      | 1          |
| Mean duration from PICC insertion to DVT diagnosis, d (range) | 9.5 (1-64) |
| Veins affected by DVT <sup>a</sup>                            |            |
| Axillary                                                      | 49         |
| Subclavian                                                    | 26         |
| Basilic                                                       | 10         |
| Brachial                                                      | 3          |
| Cephalic                                                      | 3          |

See Table 1 legend for expansion of abbreviation.

<sup>a</sup>Multiple veins could be involved during the same incidence of DVT.



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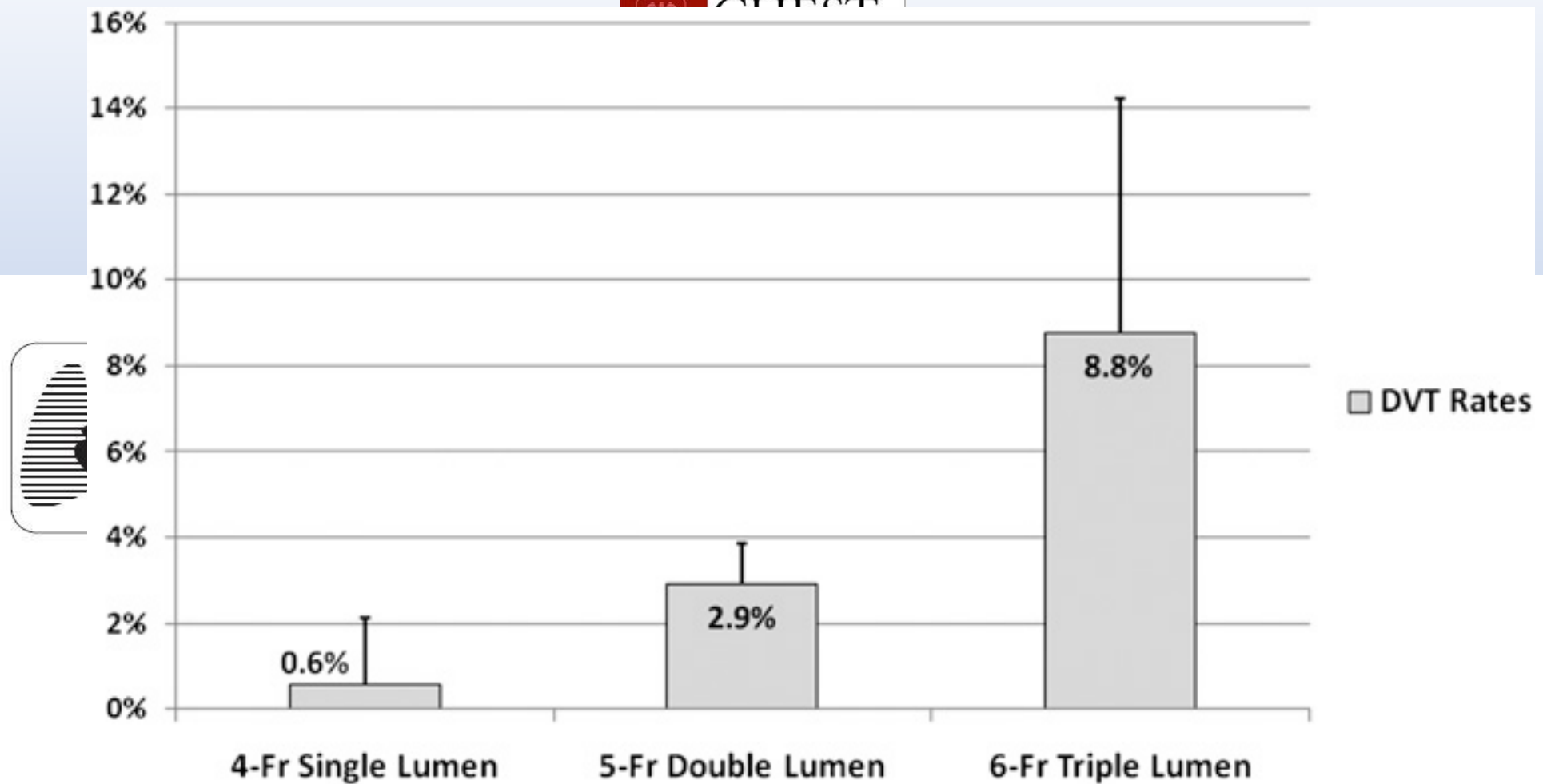
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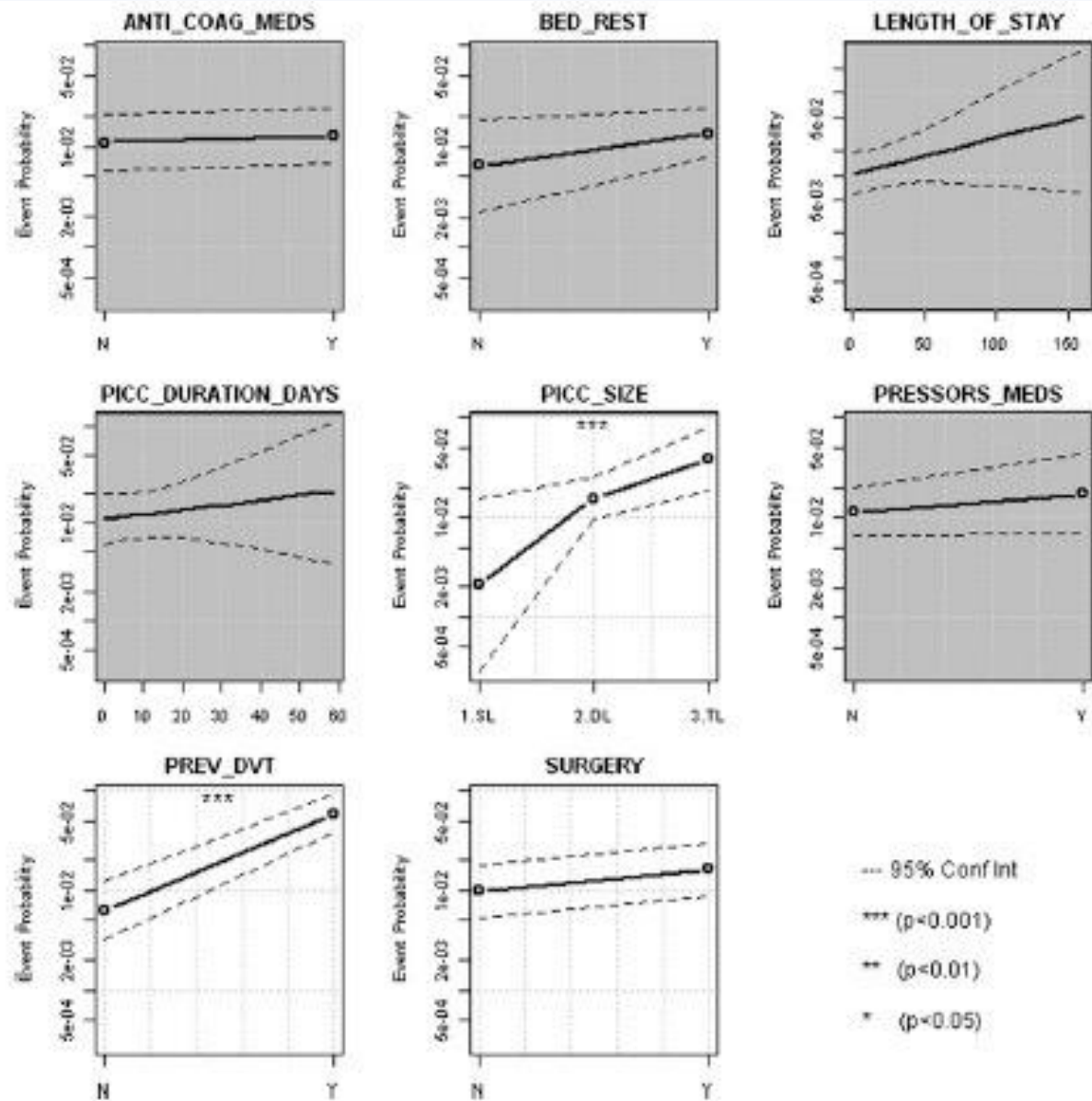
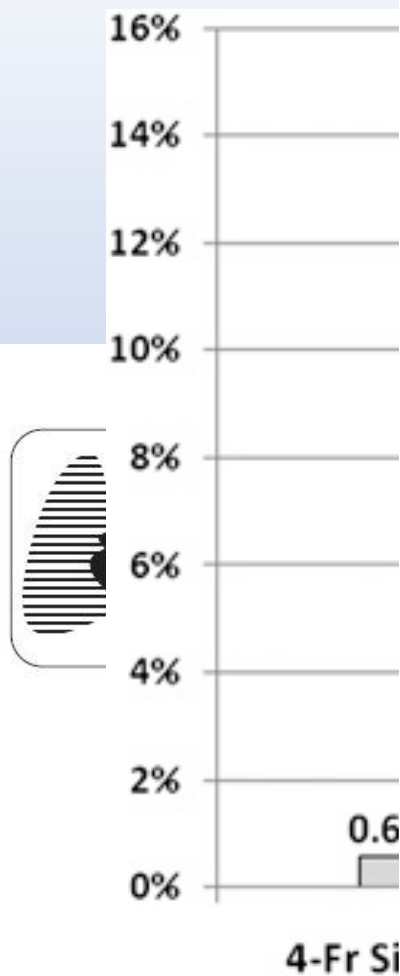
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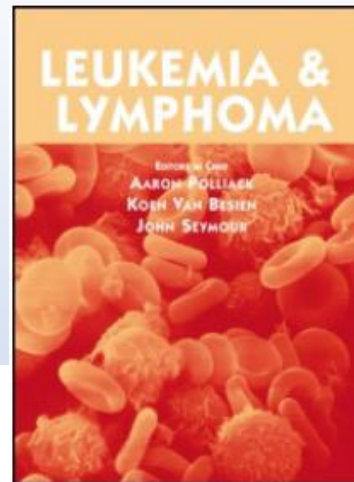


<sup>a</sup>Multiple veins could be involved during the same incidence of DVT.



□ DVT Rates

:803-810



LEUKEMIA & LYMPHOMA  
<https://doi.org/10.1080/10428194.2019.1646908>



ORIGINAL ARTICLE



## Comparison of complication rates and incidences associated with different peripherally inserted central catheters (PICC) in patients with hematological malignancies: a retrospective cohort study

Nicholas Scrivens<sup>a</sup> , Elham Sabri<sup>a</sup>, Christopher Bredeson<sup>a,b,c</sup> and Sheryl McDiarmid<sup>a,b</sup>

<sup>a</sup>The Ottawa Hospital Research Institute, Ottawa, ON, Canada; <sup>b</sup>Division of Hematology, The Ottawa Hospital, Ottawa, ON, Canada;

<sup>c</sup>The University of Ottawa, Ottawa, ON, Canada

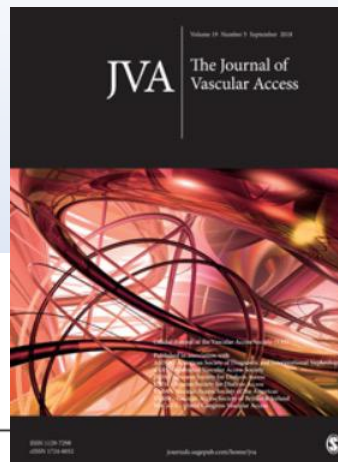


**Table 3.** Incidence and rate of PICC-associated complications.

|                       | Groshong          | BioFlo               | PowerPICC Solo       | ARROW                | p-value   |
|-----------------------|-------------------|----------------------|----------------------|----------------------|-----------|
| No. of PICCs          | 161               | 165                  | 60                   | 99                   |           |
| No. of patients       | 157               | 164                  | 59                   | 93                   |           |
| All complications     |                   |                      |                      |                      |           |
| No. of PICC (%)       | 60 (37.27)        | 69 (41.82)           | 37 (61.67)           | 55 (55.56)           | 0.0013**  |
| Per 1000 CDs (95% CI) | 7.40 (6.20, 8.85) | 13.61 (11.76, 15.76) | 16.21 (13.31, 19.74) | 26.41 (22.81, 30.57) | <0.0001*  |
| UEDVT                 |                   |                      |                      |                      |           |
| No. of PICC (%)       | 5 (3.11)          | 18 (10.91)           | 3 (5)                | 10 (10.1)            | 0.0316**  |
| Per 1000 CDs (95% CI) | 0.31 (0.13, 0.74) | 1.37 (0.86, 2.17)    | 0.49 (0.16, 1.52)    | 1.48 (0.79, 2.74)    | 0.002*    |
| CLABSI                |                   |                      |                      |                      |           |
| No. of PICC (%)       | 9 (5.59)          | 7 (4.24)             | 3 (5)                | 5 (5.05)             | 0.944**   |
| Per 1000 CDs (95% CI) | 0.61 (0.33, 1.14) | 0.53 (0.25, 1.12)    | 0.65 (0.25, 1.74)    | 0.74 (0.31, 1.77)    | 0.955*    |
| Migrations            |                   |                      |                      |                      |           |
| No. of PICC (%)       | 31 (19.25)        | 19 (11.52)           | 5 (8.33)             | 20 (20.2)            | 0.051**   |
| Per 1000 CDs (95% CI) | 2.69 (2.00, 3.62) | 2.13 (1.47, 3.08)    | 0.98 (0.44, 2.19)    | 3.69 (2.49, 5.46)    | 0.009*    |
| Complete occlusions   |                   |                      |                      |                      |           |
| No. of PICC (%)       | 22 (13.66)        | 28 (16.97)           | 26 (43.33)           | 31 (31.31)           | <0.0001** |
| Per 1000 CDs (95% CI) | 2.20 (1.59, 3.05) | 4.03 (3.08, 5.28)    | 9.00 (6.91, 11.73)   | 10.62 (8.43, 13.38)  | <0.0001*  |
| Withdrawal occlusions |                   |                      |                      |                      |           |
| No. of PICC (%)       | 11 (6.83)         | 33 (20)              | 17 (28.33)           | 27 (27.27)           | <0.0001** |
| Per 1000 CDs (95% CI) | 1.35 (0.89, 2.04) | 5.32 (4.21, 6.73)    | 4.91 (3.43, 7.02)    | 8.41 (6.49, 10.9)    | <0.0001*  |
| Other                 |                   |                      |                      |                      |           |
| No. of PICC (%)       | 4 (2.48)          | 3 (1.82)             | 1 (1.67)             | 9 (9.09)             | 0.021**   |
| Per 1000 CDs (95% CI) | 0.24 (0.09, 0.65) | 0.23 (0.07, 0.71)    | 0.16 (0.02, 1.16)    | 1.48 (0.79, 2.74)    | 0.0019*   |



*Original research article*



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# **Chlorhexidine-coated peripherally inserted central catheters reduce fibroblastic sleeve formation in an in vivo ovine model**

**Charles J Sylvia Jr<sup>1</sup>, Molly A Wagel<sup>2</sup>, Kamna Giare-Patel<sup>2</sup>,  
Taylor A Spangler<sup>3</sup>, Eugene M Breznock<sup>1</sup> and Nisha Gupta<sup>2</sup>**

The Journal of Vascular Access  
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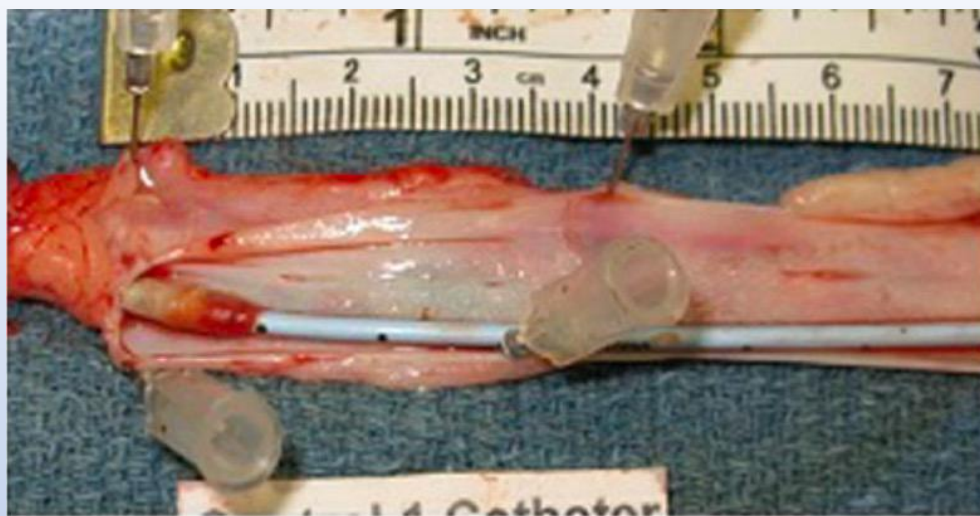
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DOI: 10.1177/1129729818769033

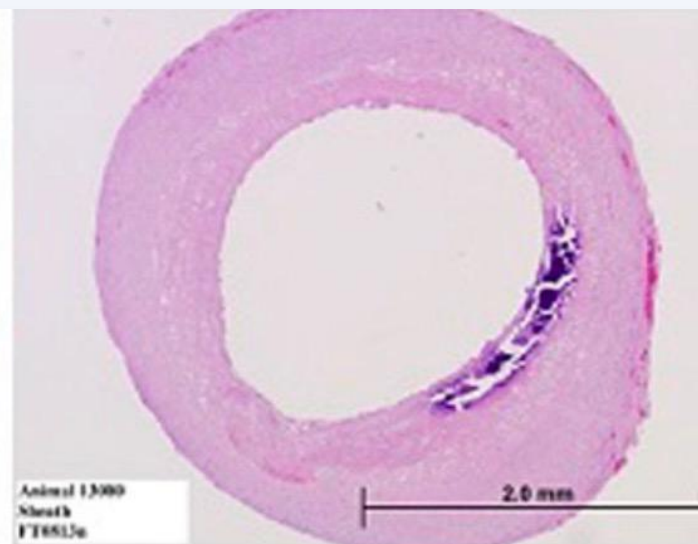
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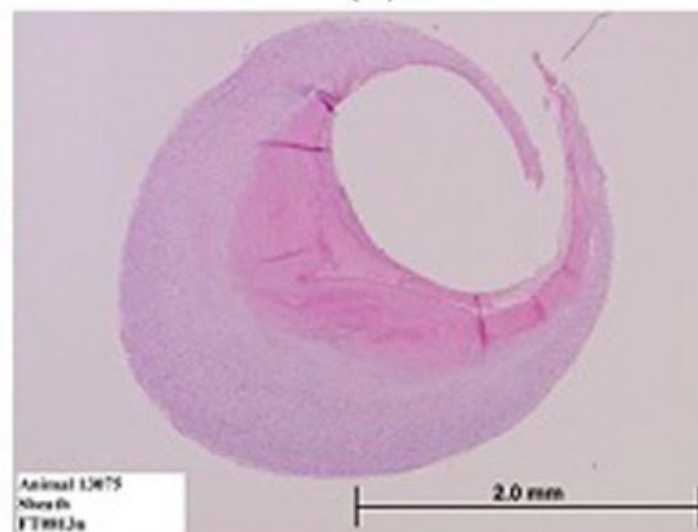




(a)



(b)



# PICNIC TRIAL 2025

The NEW ENGLAND JOURNAL of MEDICINE

## ORIGINAL ARTICLE

### A Comparison of Peripherally Inserted Central Catheter Materials

Amanda J. Ullman, Ph.D., Deanne August, Ph.D., Tricia M. Kleidon, M.Nurs.Prac., Rachel M. Walker, Ph.D., Nicole Marsh, Ph.D., Andrew C. Bulmer, Ph.D., Ben Pearch, M.B., B.S., Naomi Runnegar, M.B., B.S., Joanne Leema, B.N., Paul Lee-Archer, Ph.D., Cathy Biles, B.N., Victoria Gibson, B.N., Ruth Royle, M.Econ., Katrina Southam, B.N., Joshua Byrnes, Ph.D., Vineet Chopra, M.D., Alan Coulthard, M.B., B.S., Peter Mollee, Ph.D., Claire M. Rickard, Ph.D., Patrick N. A. Harris, Ph.D., and Robert S. Ware, Ph.D.

- Multicenter RCT (1098 pts)
- Adults and children
- Endexo vs chlorhexidine vs standard polyurethane PICC
- Primary outcome: device failure infectious or noninfectious (thrombosis, breakage, or occlusion) complications



# PICNIC TRIAL 2025

## CONCLUSIONS

Among adults and children who were referred for PICC placement, the risk of device failure due to noninfectious or infectious complications was not lower with hydrophobic or chlorhexidine PICCs than with standard polyurethane PICCs. (Funded by the National Health and Medical Research Council of Australia; PICNIC Australian New Zealand Clinical Trials Registry number, ACTRN12619000022167.)

Amanda J. Ullman, Ph.D., Deanne August, Ph.D., Tricia M. Kleidon, M.Nurs.Prac.,  
Rachel M. Walker, Ph.D., Nicole Marsh, Ph.D., Andrew C. Bulmer, Ph.D.,  
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**infectious or noninfectious (thrombosis,  
breakage, or occlusion) complications**



## STRATEGIE PER LA PREVENZIONE DELLA DVT PICC-relata

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Paziente

Catetere

Impianto

**Fattori di rischio legati alla gestione:**

- **Medicazione**
- **Lavaggio pulse and pause**



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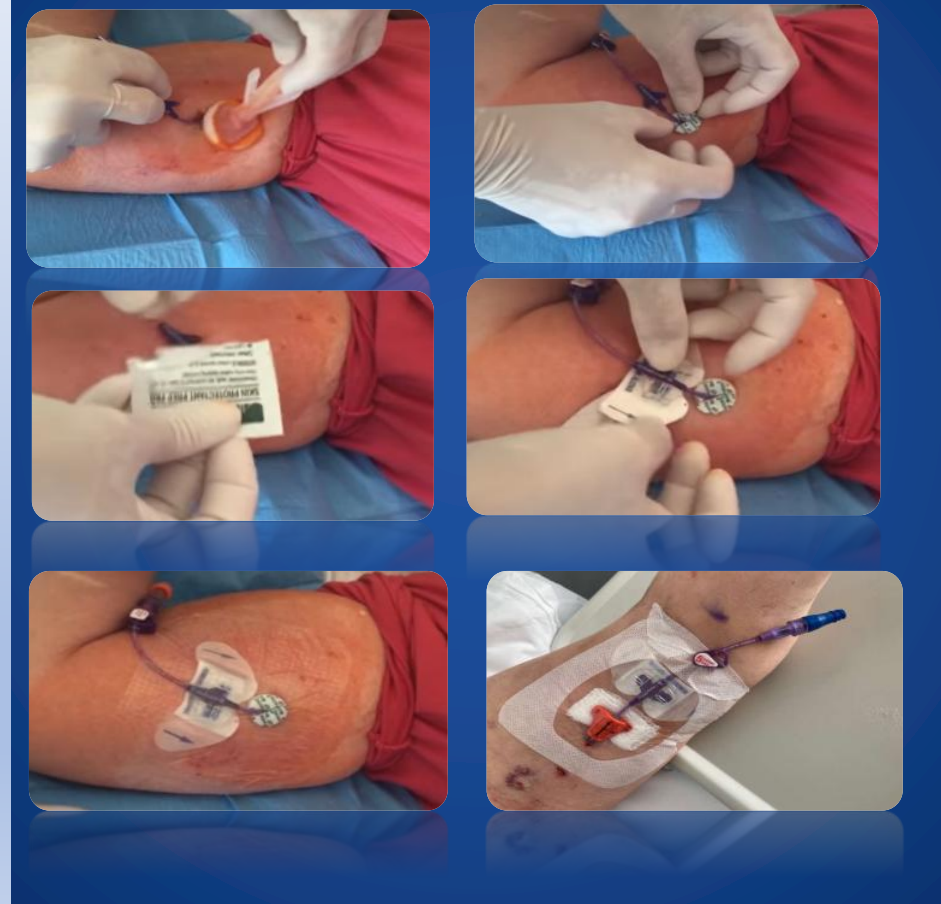
**La CRT è più probabile che si verifichi:**

- **Nei VAD periferici, se utilizzati per soluzioni associate a danno endoteliale**
- **Nei VAD centrali con posizione della punta non ottimale (ad esempio: punta verificata solo radiologicamente; o, nei VAD centrali parzialmente dislocati), se utilizzati per soluzioni associate a danno endoteliale**
- **Nei VAD stabilizzati in modo inappropriato**



## Appropriata stabilizzazione del catetere

- Scelta dell'*exit site* appropriato
  - Metà braccio (PICC), zona infraclaveare (CICC), metà coscia (FICC)
- Fissaggio corretto
  - Colla, fissaggio sutureless, membrane trasparenti



## CONCLUSIONI (CRT)

- La CRT è una complicanza frequente, ma che nella maggior parte dei casi: (a) ha evoluzione benigna, (b) risponde rapidamente al trattamento, (c) non si associa ad elevati costi assistenziali, (d) non si associa a rischi gravi per il paziente, (e) non comporta la interruzione dell'utilizzo del device
- Il rischio di CRT ha una componente non prevenibile (trombofilia del paziente -malattia neoplastica) e una componente prevenibile (tecnica di impianto)



# In sintesi (e in conclusione): il bundle GAVeCeLT per la prevenzione della CRT

- 1) Scegliere una vena di diametro appropriato (almeno 3 volte il calibro esterno del catetere)
- 2) Utilizzare la guida ecografica e i kit microintroduttori
- 3) Utilizzare metodi intraprocedurali accurati per la localizzazione della punta (come IC-ECG e TTE)
- 4) Stabilizzare il catetere il più possibile
- 5) Profilassi con EBPM solo in casi selezionati



# AMBULATORIO ACCESSI VASCOLARI e TAV Team Accessi Vascolari multidisciplinare

